# Report Documentation Page

*Form Approved*
*OMB No. 0704-0188*



| 1. REPORT DATE | 2. REPORT TYPE | 3. DATES COVERED |
|---|---|---|
| **2009** | | **00-00-2009 to 00-00-2009** |

| 4. TITLE AND SUBTITLE | 5a. CONTRACT NUMBER |
|---|---|
| **Arroyo Center Annual Report 2009** | 5b. GRANT NUMBER |
| | 5c. PROGRAM ELEMENT NUMBER |
| 6. AUTHOR(S) | 5d. PROJECT NUMBER |
| | 5e. TASK NUMBER |
| | 5f. WORK UNIT NUMBER |
| 7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)<br>**Rand Corporation,Arroyo Center,1776 Main Street, PO Box 2138,Santa Monica,CA,90407-2138** | 8. PERFORMING ORGANIZATION REPORT NUMBER |
| 9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) | 10. SPONSOR/MONITOR'S ACRONYM(S) |
| | 11. SPONSOR/MONITOR'S REPORT NUMBER(S) |

12. DISTRIBUTION/AVAILABILITY STATEMENT
**Approved for public release; distribution unlimited**

13. SUPPLEMENTARY NOTES

14. ABSTRACT

15. SUBJECT TERMS

| 16. SECURITY CLASSIFICATION OF: | | | 17. LIMITATION OF ABSTRACT | 18. NUMBER OF PAGES | 19a. NAME OF RESPONSIBLE PERSON |
|---|---|---|---|---|---|
| a. REPORT | b. ABSTRACT | c. THIS PAGE | | | |
| **unclassified** | **unclassified** | **unclassified** | **Same as Report (SAR)** | **68** | |

Corporate publications are program or department brochures, newsletters, pamphlets, and miscellaneous information about the RAND Corporation or RAND's business units. Some corporate publications are published in the AR series as Annual Reports or as Administrative Reports. Administrative Reports are often required by the client or sponsor and provide a status report on work resulting from a contract.

RAND ARROYO CENTER

# Annual Report 2009

**www.rand.org**

**Headquarters Campus**
1776 Main Street
P.O. Box 2138
Santa Monica, CA 90407-2138
TEL 310.393.0411
FAX 310.393.4818

**Washington Office**
1200 South Hayes Street
Arlington, VA 22202-5050
TEL 703.413.1100
FAX 703.413.8111

**Pittsburgh Office**
4570 Fifth Avenue, Suite 600
Pittsburgh, PA 15213-2665
TEL 412.683.2300
FAX 412.683.2800

**New Orleans Office**
RAND Gulf States Policy Institute
650 Poydras Street, Suite 1400
New Orleans, LA 70130
TEL 504.558.1975
FAX 504.299.3471

**Jackson Office**
RAND Gulf States Policy Institute
P.O. Box 3788
Jackson, MS 39207-3788
TEL 601.979.2449
FAX 601.354.3444

**Boston Office**
20 Park Plaza, Suite 720
Boston, MA 02116
TEL 617.338.2059
FAX 617.357.7470

**Doha Office**
RAND-Qatar Policy Institute
P.O. Box 23644
Doha, Qatar
TEL +974.492.7400
FAX +974.492.7410

**RAND Europe**
Westbrook Centre
Milton Road
Cambridge CB4 1YG
United Kingdom
TEL +44.1223.353.329
FAX +44.1223.358.845

37, Square de Meeus
B-1000 Brussels
Belgium
TEL +32.2.791.7500
FAX +32.2.791.7900


ARROYO CENTER

# Annual Report 2009

# Letter from the Acting Director

The U.S. Army is well into its ninth consecutive year of combat in Iraq and Afghanistan, surpassing the length of all other conflicts in the nation's history save Vietnam. The conflict in Iraq appears to be reaching a conclusion—but the one in Afghanistan is waxing as the United States ratchets up its troop strength and begins to drive the Taliban out of long-held territory. These two conflicts and their effects on the Army's soldiers and families rightly command the unwavering attention of the Army's leadership. But, important as they are, they are not the only issues the Army must deal with. This is where RAND Arroyo Center enters the picture, and, indeed, is the reason some of the Army's most visionary leaders called Arroyo into being in 1982. They charged Arroyo with helping the leadership identify the most critical challenges before the Army and providing the research and analysis to support sound decisionmaking.

Arroyo has structured itself to carry out that charge, organizing its research efforts around strategy, doctrine, and resources; force development and technology; manpower and training; and military logistics. It has recently added a new organizational initiative. In recognition of the burgeoning physical and mental health care issues affecting soldiers, veterans, and their families, RAND Arroyo Center has launched a joint initiative with RAND Health, a national leader in health policy analysis. The Arroyo Military Health Policy Research initiative conducts analyses related to the medical readiness and health benefit missions of the Army.

This annual report summarizes the research agendas of these five areas of inquiry. It also recounts the results of several quick-response studies conducted to help the Army leadership respond to pressing near-term problems. Arroyo's ability to carry out such short-notice studies reflects the benefit of the long-term development of intellectual capital, which provides Arroyo's research staff with the experience and expertise needed to respond rapidly with high-quality analyses. The quick-response studies in FY 2009 focused on such disparate topics as the possible side effects of transformation policies and the ARFORGEN process, force ratios for security force assistance, and the effects of different force deployment ratios.

*Tim Bonds, acting director of RAND Arroyo Center.*

This report also highlights several noteworthy research projects. One explored the issue of the Army's ability to deploy additional forces to Iraq and Afghanistan in response to the claim that one-third of Army had never deployed. That research, done for the Vice Chief of Staff, showed that most soldiers had indeed deployed—many of them multiple times; that the Army sped up rotations so that more could deploy; and that scant capacity remained to deploy additional active-duty soldiers.

Another study explored the role that civilians can play in stability operations. While not many civilian agencies need to be involved, the ones that do, while capable, lack the capacity and incentives to deploy.

The BRAC-directed move of Human Resources Command from Washington to Fort Knox, Kentucky,

in conjunction with a directive to reduce personnel by one-third, prompted another research effort. It showed that many of Human Resources Command's professional staff would most likely not relocate to Fort Knox and that recruiting the requisite talent in the Fort Knox area could be difficult. Forewarned, the command now has the time to develop a long-term recruiting, development, and management strategy.

Operations Iraqi Freedom and Enduring Freedom have strained the Army's logistical systems, and Arroyo analysis has helped it structure its war reserve materiel so that it provides responsive support at lower cost. Flying parts to theater can be expensive, especially if they are heavy. Arroyo analyzed the demands units had made on war reserve stocks and recommended that the Army position forward fast-moving items that are relatively inexpensive but weigh a lot. While it might make sense to fly an expensive tank engine to theater, it would not for batteries. So those should be stocked forward. Careful stock policies can dramatically reduce the number of aircraft required to keep the force supplied.

The studies summarized here and many others exemplify Arroyo's mission to provide Army leaders with high-quality, objective analyses. Every Arroyo study is conducted in direct response to the needs of one or more senior leaders who sponsor the work, and those Army leaders who sponsor our research are critical to its value to the Army. In fact, there may be no better indicator of our success in accomplishing our mission than simply noting who among the Army leadership makes use of our analytic capabilities. In 2009, this list was long and diverse, headed by the Vice Chief of Staff and other general officers and Army civilian leaders who make up the Arroyo Center Policy Committee.

Arroyo's success depends not only on the quality of our research but also on the quality of the engagement between Arroyo researchers and Army leadership. The willingness of the Army's senior leaders to engage with Arroyo's researchers is indispensable not only for identifying the research that the Army needs to deal with its most critical issues but also for facilitating the execution of the research and insuring the utilization of its results.

I believe 2009 marked a recent high point in this engagement, and I am pleased to present in these pages an overview of Arroyo's contributions. We are proud to be the Army's partner and to provide the research needed at a time when the Army carries one of the heaviest burdens in its history of service to the nation. ■

# Contents

SECTION 1

# RAND Arroyo Center Overview

## Mission and Contributions

Founded in 1982, RAND Arroyo Center is the United States Army's sole federally funded research and development center (FFRDC) for studies and analysis.[1] As an FFRDC, Arroyo enables the Army to maintain a strategic relationship with an independent, nonprofit source of high-quality, objective analysis that can sustain deep expertise in domains of direct relevance to perennial Army concerns. Accordingly, RAND Arroyo Center's mission is to:

- Conduct objective analytic research on major policy concerns, with an emphasis on mid- to long-term policy issues.
- Help the Army improve effectiveness and efficiency.
- Provide short-term assistance on urgent problems.
- Be a catalyst for needed change.

In carrying out its mission, Arroyo investigates the full range of Army issues and aims to:

- Adapt to change and get out ahead of some of the changes in the world affecting the Army.
- Define innovative and different ways of operating.
- Maintain objectivity and balance in addressing controversial and sensitive subjects.
- Make unique contributions to the Army's key areas of interest.

RAND Arroyo Center provides Army leadership with research products and services in four major categories, as listed in Table 1.1: research projects, training and education, subject matter experts, and research documents.

This annual report provides information on four types of these products and services. Section 2 provides lists of selected studies conducted in fiscal year 2009, and Section 3 provides summaries of eight studies. Section 4 describes training and education opportunities for mid-level Army officers and identifies the officers participating in 2008–09. The final section of the report lists selected research documents published in 2009.

## Oversight and Management

The Army's oversight and management of RAND Arroyo Center is stipulated by Army Regulation 5-21.[2] The regulation establishes a governing board of Army leaders known officially as the Arroyo Center Policy Committee (ACPC). The ACPC is co-chaired by the Vice Chief of Staff of the Army and the Assistant Secretary of the Army (Acquisition, Logistics and Technology); current

**Table 1.1**
**RAND Arroyo Center Research Products and Services**

| | |
|---|---|
| **Research Projects**<br>• DA-funded annual studies<br>• DA-funded quick-response and direct support studies<br>• Sponsor-funded studies | **Training and Education**<br>• Army Fellows Program<br>• Temporary assignments<br>• RAND Ph.D. in policy analysis* |
| **Subject Matter Experts**<br>• Pentagon briefing series<br>• Annual logistics seminars<br>• Tailored briefings and seminars<br>• Embedded analysts | **Research Documents**<br>• Announcements of new research<br>• Publications and summaries<br>• Web site |

DA = Department of the Army.
*The doctoral program is available through the Pardee RAND Graduate School, a separate unit of the RAND Corporation; Army officers enrolled as graduate students commonly receive on-the-job (OJT) training working with RAND analysts on policy studies, including Arroyo studies.

[1] Originally established at the Jet Propulsion Laboratory in Pasadena, California, the Arroyo Center was moved to RAND in 1984 at the request of the Chief of Staff of the Army.

[2] See the regulation at http://www.armystudyguide.com/content/publications/army_regulations/ar-521.shtml.

members are listed on page 9. One member of the ACPC, the Director for Program Analysis and Evaluation, serves as Executive Agent for the Arroyo Center, charged with oversight of its daily operations.

The ACPC meets at least twice a year with Arroyo management to provide overall guidance, review the annual research plan, and approve individual projects. Additionally, each project is sponsored by at least one Army senior leader, either a general officer or a member of the Senior Executive Service. The sponsor has responsibility for helping to formulate the project, providing access to needed data and other information, monitoring its progress, reviewing its publications for accuracy, utilizing its findings, and implementing its recommendations.

At RAND, the Arroyo Center is managed within the Army Research Division, one of the largest of RAND's research units.

Arroyo organizes its work for the Army into four research programs and one research area that represent broad policy areas:

- Strategy, Doctrine, and Resources Program
- Force Development and Technology Program
- Manpower and Training Program
- Military Logistics Program
- Arroyo Military Health Policy Research

The organizational chart on page 10 identifies the Arroyo management team. ■

*Marcy Agmon, director of operations.*

# Arroyo Center Policy Committee

■ **General Peter W. Chiarelli (Co-Chair)**
Vice Chief of Staff, U.S. Army

■ **Mr. Dean G. Popps (Co-Chair)**
Principal Deputy Assistant Secretary of the Army (Acquisition, Logistics and Technology)/Director for Iraq Reconstruction and Program Management

■ **Honorable Thomas R. Lamont**
Assistant Secretary of the Army (Manpower and Reserve Affairs)

■ **General Charles C. Campbell**
Commanding General, U.S. Army Forces Command

■ **General Martin E. Dempsey**
Commanding General, U.S. Army Training and Doctrine Command

■ **General Ann E. Dunwoody**
Commanding General, U.S. Army Materiel Command

■ **Mr. Terrence C. Salt**
Principal Deputy Assistant Secretary of the Army (Civil Works)/Deputy Assistant Secretary of the Army (Legislation)

■ **Mr. Robert M. Speer**
Principal Deputy Assistant Secretary of the Army (Financial Management and Comptroller)

■ **Lieutenant General Benjamin C. Freakley**
Commanding General, U.S. Army Accessions Command

■ **Lieutenant General Robert P. Lennox**
Deputy Chief of Staff, G-8, U.S. Army

■ **Lieutenant General Ricky Lynch**
Assistant Chief of Staff for Installation Management/ Commanding General, Installation Management Command, U.S. Army

■ **Lieutenant General John F. Mulholland**
Commanding General, U.S. Army Special Operations Command

■ **Lieutenant General Eric B. Schoomaker**
Commanding General, U.S. Army Medical Command/ The Surgeon General

■ **Lieutenant General Jeffrey Sorenson**
Chief Information Officer, G-6, U.S. Army

■ **Lieutenant General Mitchell H. Stevenson**
Deputy Chief of Staff, G-4, U.S. Army

■ **Lieutenant General Jack C. Stultz, Jr.**
Chief, Army Reserve/Commanding General, U.S. Army Reserve Command

■ **Lieutenant General James D. Thurman**
Deputy Chief of Staff, G-3/5/7, U.S. Army

■ **Lieutenant General Richard P. Zahner**
Deputy Chief of Staff, G-2, U.S. Army

■ **Major General Gina B. Farrisee**
Acting Deputy Chief of Staff, G-1, U.S. Army

*Executive Agent for the Arroyo Center*

■ **Major General Joseph E. Martz**
Director, Program Analysis and Evaluation

*Membership effective December 2009.*

# RAND Arroyo Center Management

- **Jeff Isaacson**, Vice President and Director*
- **Tim Bonds**, Deputy Director and Acting Director
- **Chip Leonard**, Acting Deputy Director
- **Marcy Agmon**, Director of Operations
- **Rick Eden**, Communications and Research Quality Assurance

** Effective March 27, 2009, Dr. Isaacson was mobilized for active duty and shortly thereafter deployed to Afghanistan.*

### Strategy, Doctrine, and Resources Program

- **Laurinda L. Rohn**, Director

### Force Development and Technology Program

- **Bruce Held**, Director

### Manpower and Training Program

- **Bruce Orvis**, Director

### Military Logistics Program

- **Eric Peltz**, Director

### Arroyo Military Health Policy Research

- **Sue Hosek** and **Terri Tanielian**, Co-directors

SECTION 2

# Fiscal Year 2009 Research Agenda

## Interactive Development of the Agenda

As an FFRDC, RAND Arroyo Center operates under a renewable five-year contract that provides a core of funding to which the Army may add other funds for additional studies. In FY 2009 about half of the projects conducted by RAND Arroyo Center were "core" studies and the other half "add-on" studies. To help assure the usefulness and relevance of each study, the process by which it is formulated involves a high degree of interaction and coordination between the Army sponsors and the Arroyo research managers and project leaders.

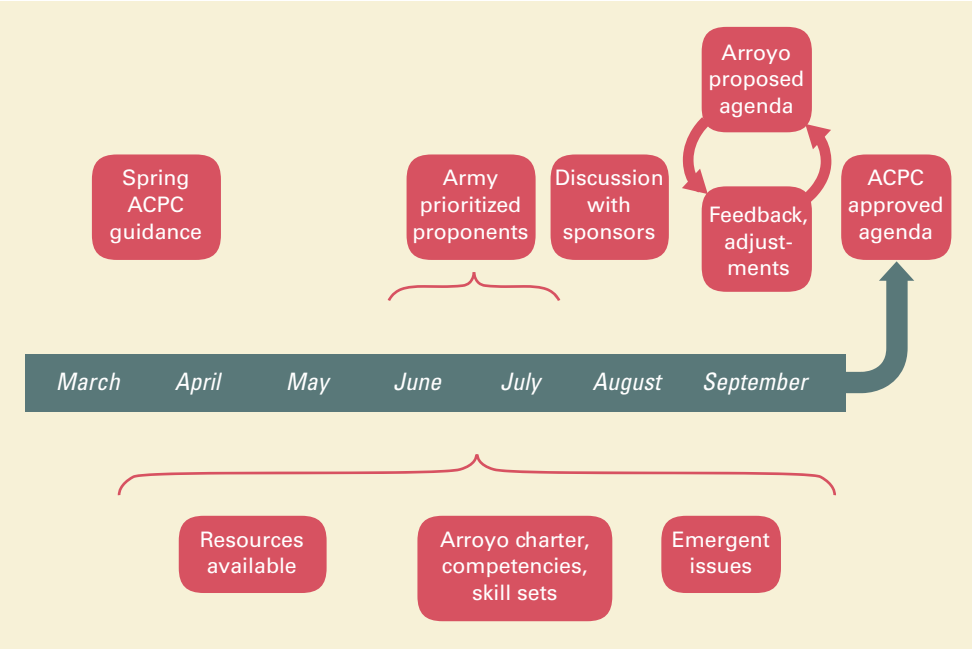
As Figure 2.1 shows, the process for developing an annual research agenda for core studies starts in late April and concludes in September before the beginning of the fiscal year in which the studies will be initiated. Arroyo's Executive Agent sends a memorandum to the ACPC members requesting research proposals. Shortly thereafter, Arroyo's director and program directors begin discussing research ideas with their respective sponsors. At the same time, prospective project leaders are discussing potential ideas with their colleagues and program directors.

The number of proposals typically greatly exceeds the number of projects for which funds are available. Individually and as a group, the proposals are evaluated within the context of criticality to the Army; available funding; and Arroyo's mission, available expertise, and comparative advantage to conduct the research. A small amount of core funding is reserved for later allocation to research undertaken to address important issues that may emerge during the fiscal year. In its fall meeting, the ACPC approves the research agenda of core projects for the next fiscal year.

The process for an Army sponsor to add a study to the research agenda during the course of the year by using funds other than the core is also highly interactive. The Executive Agent approves add-on projects. This may be done at any point during the fiscal year so long as Arroyo's total level of effort for the year does not exceed a ceiling established by the Office of the Secretary of Defense.

The remainder of this section describes the FY 2009 research studies, beginning with quick-response studies and continuing with studies in Arroyo's four programs and its new research area on military health policy. ■

**Figure 2.1**
**The Arroyo Center Works Closely with Army Leadership to Develop Core Studies**



# Quick-Response Studies

RAND Arroyo Center reserves a portion of its research agenda for small, quick studies on important issues that emerge during the course of the fiscal year. In FY 2009, Arroyo performed five quick-response studies for the Army.

■ **Collateral Impacts of Transformation and Army Force Generation (ARFORGEN) Processes and Procedures.** This study helped the Army determine the possible side effects of transformation policies and the procedures designed to prepare and deploy units within the ARFORGEN process. It evaluated the extent and severity of side effects and their connection to current and future policies and operational requirements, and then developed and evaluated means to compensate for or reduce negative side effects. The examination included indicators of soldier and family well-being, possible effects on recruiting and retention, near- and longer-term impacts on unit effectiveness, implications for the long-term development of professional soldiers, and evidence of undesirable outcomes resulting from policies applied to installations. Sponsored by the Vice Chief of Staff, U.S. Army, and the Director, Program Analysis and Evaluation, Office of the Deputy Chief of Staff, G-8, U.S. Army.

■ **Making Tough Choices About Defense Priorities: A Panel Discussion Forum.** This study facilitated public discussions among defense experts regarding defense investment priorities by organizing a series of panel discussions on specific issues and decisions affecting the ability of both the Department of Defense and the Army to provide adequate land capabilities across the spectrum of conflict. Sponsored by MG Robert P. Lennox, G-8, Quadrennial Defense Review Office.

■ **Estimating the Impact of Deployment Ratios.** This study analyzed and helped the Army articulate the effects of varying levels of operational deployment tempo by comparing relevant implications of a 1:2 versus 1:3 deployed time to nondeployed time ratio. It presented the implications in terms of effects on the Army's operational forces and on the ability of the institutional parts of the Army to perform their functions. Sponsored by the Deputy Chief of Staff, G-3/5/7.

■ **Force Ratios for Security Force Assistance Missions.** This study analyzed existing literature on and past and current practices in security force assistance missions to determine whether a range of effective ratios of advisor forces to advisee forces can be identified. Sponsored by the Deputy Chief of Staff, G-3/5/7.

■ **Deployment Demands of Operation Enduring Freedom and Operation Iraqi Freedom.** This study assessed the demands placed upon the Army by deployments to Operation Enduring Freedom (OEF) in Afghanistan and Operation Iraqi Freedom (OIF) in Iraq. Sponsored by the Vice Chief of Staff, U.S. Army, and the Army Quadrennial Defense Review Office. ■

# Strategy, Doctrine, and Resources Program

## Mission and Research Streams

The Strategy, Doctrine, and Resources Program analyzes the implications of the dynamic security environment for future strategic concepts, Army roles and missions, force structure, capabilities, doctrine, and resourcing requirements.

To accomplish its mission, the program sustains research streams in seven policy domains:

- Assessing the evolving operating environment
- Developing capabilities to face new challenges
- Developing partner capabilities
- Improving capabilities for stability operations
- Improving resource management
- Learning from past and present operations
- Supporting Army wargames and analysis

Maintaining expertise in these strategy, doctrine, and resource domains also allows Arroyo to provide timely short-term assistance on issues of importance to the Army.

The program's FY 2009 research agenda within each of these streams is described below.

## FY 2009 Studies in Strategy, Doctrine, and Resources

### *Assessing the Evolving Operating Environment*

■ **Assessing Jihadi Strategies, Phase III.** This study continued ongoing work on the collection, translation, and analysis of primary texts relating to al-Qa'ida and salafi-jihadi grand strategy and theater strategy to provide indications and warning of strategic shifts. Sponsored by the Deputy Chief of Staff, G-2.

### *Developing Capabilities to Face New Challenges*

■ **Army Global Posture.** This study examined the global positioning of Army forces and assets in the light of ongoing and potential changes in the national security environment. It evaluated options for Army stationing and developed recommendations to improve future Army responsiveness. Sponsored by the Deputy Chief of Staff, G-8.

■ **U.S. Army Civil Affairs Force Requirements.** This study determined Army requirements (in terms of skills, size, and location in the total force) for civil affairs capabilities throughout the spectrum of operations, ranging from small-scale persistent presence to large-scale stability and major combat operations, including both general purpose forces and special operations

*Lauri Rohn is the director of the Strategy, Doctrine, and Resources Program, and Adam Grissom is an associate director.*

*Santa Monica–based researchers in the Strategy, Doctrine, and Resources Program include (left to right) Tom Szayna, Paul Dreyer, Lisa Saum-Manning, and Derek Eaton. Tom is an associate director of the program.*

forces. It provided long- and short-term recommendations to solve or mitigate identified gaps across relevant elements of DOTLMPF (doctrine, organization, training, leader development, materiel, personnel, and facilities). Sponsored by U.S. Army Special Operations Command; the Office of the Chief, Army Reserve; and the Deputy Chief of Staff, G-3/5/7.

■ **Future Army Special Operations Aviation (ARSOA) Force Structure Requirements.** This study identified the ARSOA force structure required to support future Army special operations missions. It identified shortfalls in ARSOA structure and also assessed the Army's potential role in rotary-wing foreign internal defense and the implications for ARSOA structure. Sponsored by U.S. Army Special Operations Command and the Deputy Chief of Staff, G-3/5/7.

■ **Improving Army Strategic Communications, Phase II.** This study continued and expanded upon an FY 2008 study by extending an Arroyo-developed survey of Army personnel on strategic communications issues to the Army National Guard and Army Reserve, providing a comprehensive view of the strategic communications attitudes and behaviors in the Total Force, and identifying areas where the Army can take steps to improve strategic communications and cultivate "a culture of engagement." Sponsored by the Office of the Chief of Public Affairs.

■ **Enhancing the Effectiveness of Security Force Assistance in Afghanistan.** This study analyzed the effectiveness of ongoing security force assistance efforts in Afghanistan and developed recommendations to improve these efforts. Sponsored by the Deputy Chief of Staff, G-3/5/7.

■ **Implementing FM (Field Manual) 3-0.** This study assessed the extent of institutional changes required to implement the goals of Army FM 3-0, *Operations*, across the DOTLMPF domains, paying particular attention to required changes arising from the increased salience of stability operations. It provided recommendations to Army leadership on additional efforts that may be required and identified the joint and interagency implications of the Army's implementation of FM 3-0. Sponsored by the Deputy Chief of Staff, G-8.

### *Developing Partner Capabilities*

■ **Building Partner Capacity in Africa.** This study assisted the Army in its support of U.S. Africa Command (AFRICOM) by helping to refine the process for building the capacity of partner ground forces in Africa. Sponsored by the Deputy Chief of Staff, G-3/5/7.

### *Improving Capabilities for Stability Operations*

■ **Identifying Principles for Successful Transitions from Military Authority in Stability Operations.** This study assessed the ability of U.S. Army forces to transfer responsibility and authority to other entities outside the U.S. Department of Defense (DoD) at the tactical level. It recommended measures to improve Army capabilities in this arena. Sponsored by the Deputy Chief of Staff, G-3/5/7.

■ **Specialized Versus Multipurpose Forces for Security Force Assistance and Stability.** This study assessed the pros and cons of specialized versus multipurpose forces for conducting security force assistance and stability operations missions. Sponsored by the Deputy Chief of Staff, G-8.

### *Improving Resource Management*

■ **How Major Changes in the Operating Force Should Affect the Size and Structure of the Generating Force.** This study developed a high-level model of resource and service flows within the generating force and between it and the operating force that the senior leadership of the Army can use to improve decisions about the size and structure of the generating force. Sponsored by the Assistant Secretary of the Army (Financial Management and Comptroller).

### *Learning from Past and Present Operations*

■ **An Army for Full Spectrum Operations: Lessons from Irregular Wars.** This study assessed recent "irregular" conflicts and identified their implications for U.S. Army force mix and capabilities, and the forces that support, or operate with, ground forces. Sponsored by the Deputy Chief of Staff, G-8.

### *Supporting Army Wargames and Analysis*

■ **Analytic Support to Unified Quest 2009.** This study helped the Army to better understand the unique challenges and complexities of interagency coordination in support of national security objectives and to develop strategies to better posture the Army to meet the challenges of "whole of government" operations. Sponsored by U.S. Army Training and Doctrine Command, Army Capabilities Integration Center (ARCIC).

■ **JICM Attack Helicopter Model Enhancements.** This study helped to improve Army analyses by increasing the transparency of the JICM model's simulation of attack helicopter operations. It provided assistance to Army analysts using JICM in various campaign studies and analyses. Sponsored by the Center for Army Analysis. ■

# Force Development and Technology Program

## Mission and Research Streams

RAND Arroyo Center identifies and assesses ways in which technological advances and new operational concepts can improve the Army's effectiveness in current and future conflicts. The work focuses on helping the Army determine how to maintain its technological edge against adaptable adversaries. This is accomplished by performing assessments of a technology's feasibility, performance, cost, and risk.

Most recently, the program has featured work on exploiting information technology for command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR); continued development of modeling and simulation tools for examining modern conflicts; seeking efficiencies in the materiel acquisition process; and examining emerging trends in warfighting such as IED use, cyber operations, and the use of unmanned systems. In undertaking studies and analyses for this core competency, Arroyo seeks to provide unbiased, independent assessments of new weapon systems and operational concepts that emphasize jointness. It also analyzes new technologies to support future Army analytical needs and refines strategies for developing new technologies and acquiring new systems. At the same time, both Arroyo and RAND develop and maintain analytical combat models and simulations that support this core competency.

To accomplish its mission, the program sustains research streams in six policy domains:

- Systems and technology analysis
- Networks and C4ISR
- Modeling and simulation
- Force and organizational development
- Acquisition policy
- Assessment of tactics, techniques and procedures

The program's FY 2009 research agenda within each of these streams is illustrated below.

## FY 2009 Studies in Force Development and Technology

### *Systems and Technology Analysis*

■ **Overhead Reconnaissance, Surveillance, and Target Acquisition (RSTA) and Fire Support in a Counterinsurgency (COIN) Environment.** This study addressed the question of how the Army and other services can best provide the overhead RSTA and fire support required by dispersed ground forces in a COIN environment. It identified changes in doctrine (including operating procedures), organization, materiel, and training that should be considered to meet the unique needs of dispersed ground forces. Sponsored by the Assistant Deputy Chief of Staff for Programs, G-8.

■ **Joint Force Assets to Support Army Mission Critical, Time Sensitive Needs.** This study addressed the general question of what changes to the organization and employment of joint force assets should be considered to meet the mission critical, time sensitive (MCTS) transportation needs of dispersed ground forces in a COIN environment. More specifically, it focused on the applicability of the C-27J Spartan aircraft for the MCTS mission. Sponsored by the Assistant Deputy Chief of Staff for Programs, G-8.

■ **Advanced Technology Sensors and Data Exploitation.** This study provides continuing technical support and analysis in the development of advanced technology sensors and data exploitation required for the future force. The study also provides independent, objective technical assistance to assess electronic sensor technologies and image processing algorithms, proposed sensor concepts, and competing sensor designs. Sponsored by the Night Vision and Electronic Sensors Directorate.

■ **Armoring the Force.** This study helped the Army consider a more holistic approach to force protection for its tactical wheeled vehicle fleet. It examined trends in armoring for force protection and adversary reactions to those trends to better inform acquisition and force development decisions. Sponsored by the Deputy Chief of Staff, G-3/5/7.


*Army Research Fellows working on studies in the Force Development and Technology Program include Major Robert Jones (left) and Major Albert Benson (right). Bruce Held (center left) is the director of the Force Development and Technology Program; Chris Pernin (center right) is an associate director.*

■ **Operational, Interoperable, and Affordable Analysis of the Joint Tactical Radio System (JTRS).** This study identified more optimal mixes of tactical radios, including the JTRS, for effective operations in a joint and coalition environment and for capability set years from FY 2009 to FY 2018. Sponsored by the Deputy Chief of Staff, G-3/5/7.

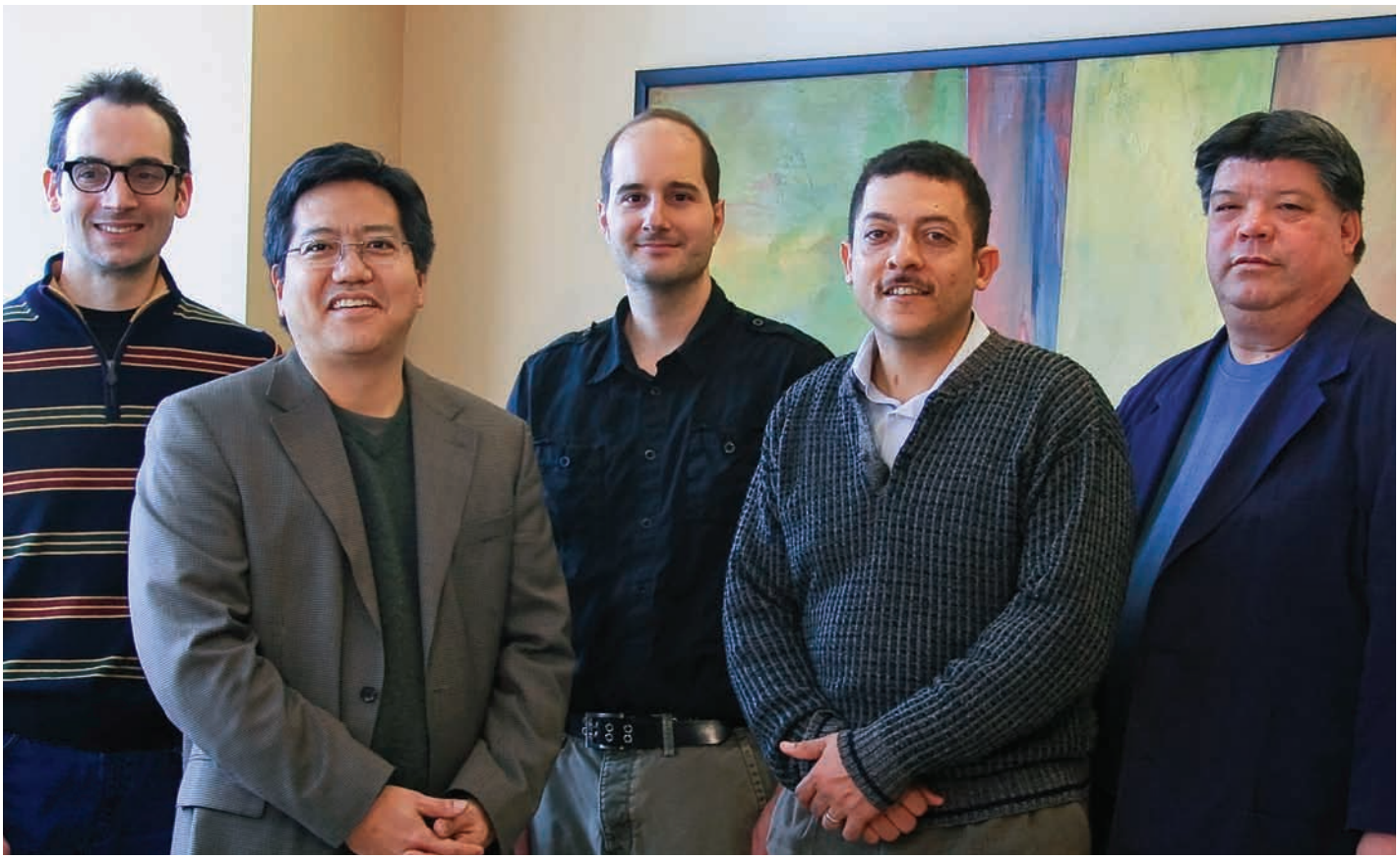
### *Networks and C4ISR*

■ **Exploring the Impact of Network Hierarchies and Associated Technologies on Force Effectiveness.** This study involved the development and real-time linking of QualNet (a commercially developed network model) with RAND's Janus-based federation of models and simulations in an attempt to help the Army understand the power and limitations of the network. It used high-resolution, force-on-force simulation to assess the effects of various C3 hierarchies on force effectiveness. Sponsored by the Assistant Secretary of the Army (Acquisition, Logistics and Technology) and the Deputy Chief of Staff, G-3/5/7.

### *Modeling and Simulation*

■ **Development of a Network Layer Protocol for Use in an Integrated Force Effectiveness—Network Model.** This study developed a network layer protocol and associated software to facilitate the representation of an adaptive, mobile digital network across multiple echelons as required for an "end-to-end" high-resolution simulation of the network envisioned for the Army's future maneuver force. Sponsored by the Assistant Secretary of the Army (Acquisition, Logistics and Technology).

■ **End-to-End Network Modeling and Simulation to Support Army Network Requirements Development.** This study initiated the development of a tool to help the Army to improve existing processes and methods for developing current and future network requirements and to examine potential hardware, software, and doctrinal solutions to the requirements. Sponsored by the Deputy Chief of Staff, G-3/5/7; U.S. Army Training and Doctrine Command (ARCIC); and the Office of the Chief Information Officer/G-6 (CIO/SAIS).



*Pittsburgh-based researchers in the Force Development and Technology Program include (left to right) David Ortiz, John Matsumura, Costa Samaras, Isaac Porche, and Tom Herbert. John is an associate director of the program.*

### *Force and Organizational Development*

■ **Developing Cyber-Operations Capability for an Expeditionary Army.** This study examined Army cyberspace capability requirements in support of primarily CONUS-based expeditionary land forces. It provided recommendations for developing expeditionary cyberspace capabilities in support of the Joint Force Commander. Sponsored by the Deputy Chief of Staff, G-8; the Deputy Chief of Staff, G-3/5/7; and U.S. Army Space and Missile Defense Command.

■ **Unmanned Aircraft Systems (UAS) Battlefield Support.** This study assessed proposed UAS and organizations for critical RSTA/ISR (reconnaissance, surveillance, targeting, acquisition/intelligence, surveillance, reconnaissance) missions in Afghanistan. The research helped answer questions on (1) how the environment and conditions differ between Iraq and Afghanistan, (2) how well U.S. technology and tactics are currently performing in Afghanistan and what platform and payload combinations work best, and (3) how the UAS assets should be organized to achieve responsive, effective Army aviation units. Sponsored by the Deputy Chief of Staff, G-3/5/7.

■ **Army Electromagnetic Spectrum Operations (EMSO).** This study provided some of the analytical underpinning needed to ensure that EMSO requirements are synchronized with LandWarNet development in a complex joint/coalition environment. As part of this analysis, the study considered the national, international, and Department of Defense policy and process changes needed to take advantage of advanced spectrum-access technologies. Finally, it recommended an implementation strategy for EMSO. Sponsored by the Chief Information Officer, G-6 and the Deputy Chief of Staff, G-3/5/7.

### *Acquisition Policy*

■ **Trends Affecting the Roles and Missions of Army Laboratories: Implications for U.S. National Security.** This study determined the implications for national security that will occur as current trends in research and development (R&D) unfold over time, particularly as they affect the laboratories and R&D centers supporting the Army. Sponsored by the Assistant Secretary of the Army (Acquisition, Logistics and Technology).

■ **Application of a RAND Portfolio Management (PortMan) Approach to Army System Development and Demonstration (SDD) Programs.** This study tailored and expanded the latest version of RAND's PortMan approach to Army SDD programs to accomplish two objectives. First, the study developed a methodology that goes beyond expected-value estimation during technology and system development in order to capture the impact of uncertainties on system performance, cost, and schedule during the SDD phase. Second, the study demonstrated the methodology by applying it at three critical stages during SDD: (1) entrance into SDD, (2) the Design Readiness Review (DRR), and (3) exit from SDD and transition to the Production and Deployment (PD) phase. Sponsored by the Deputy Assistant Secretary of the Army (Cost and Economic Analysis).

■ **Evolving a Strategy for Managing the Army's Medium and Heavy Tactical Wheeled Vehicle Fleet.** This continuing study developed snapshots of the Army's medium and heavy tactical wheeled vehicle fleet in terms of condition and age. It developed data and a process for evaluating Army equipment that will help Army programmers evaluate future resource allocation needs throughout the POM and Extended Planning Period. The data and process will also help Army requirements developers execute the conversion of Operational Requirements Documents to Capabilities Development Documents. Sponsored by the Deputy Chief of Staff, G-4.

■ **Application of System of Systems Engineering (SoSE) Principles to the Army's Materiel Development Programs.** The Office of the Assistant Secretary of the Army (Acquisition, Logistics and Technology) is developing a SoSE capability to better facilitate the U.S. Army's evolution into a network-centric force. This study examined the application of SoSE principles and recommended how to use them to efficiently implement and integrate SoSE capability into the Army acquisition framework. Sponsored by the Assistant Secretary of the Army (Acquisition, Logistics and Technology).

■ **Acquisition of Command and Control (C2) Systems.** This study is exploring how the Department of Defense acquisition system can more rapidly develop, procure, and field effective C2 systems within the framework of current policies and processes. As the research examines the issues that make C2 system acquisition difficult today, it will also develop recommendations for changes in the Army's and DoD's policies and processes that would improve the timelines for developing, procuring, and fielding such systems. Sponsored by U.S. Army Space and Missile Defense Command and the Assistant Secretary of the Army (Acquisition, Logistics and Technology). ■

# Manpower and Training Program

## Mission and Research Streams

Maintaining high-quality soldiers requires personnel policies that accomplish the key objective of the military personnel system: attracting and maintaining the right people, and then training and managing them in a way that maximizes their capabilities. In the area of this core competency, RAND Arroyo Center endeavors to understand and enhance the contribution of Army personnel, their qualities and skills, their preparation for varied missions, and their ability to coordinate actions to produce a coherent operating force. Arroyo quantitatively analyzes and tests alternative policies and resource mixes to improve effectiveness and efficiency and to develop useful approaches to key personnel issues. It develops and analyzes strategies for manning, training, and retaining quality soldiers, for structuring the future Army, and for recruiting and developing its leaders. Arroyo helps to design and understand mechanisms for providing medical and other soldier support. It assesses collective and individual training approaches for the Active and Reserve Components, and it evaluates alternative rotation, deployment, and assignment policies in support of the Army's missions.

To accomplish its mission, the program sustains research streams in eight policy domains:

- Recruiting and personnel fill requirements
- Reserve Component (RC) readiness
- Leader development
- Training
- Distributed learning, simulation training development/application, training support systems
- Retention
- Officer career fields, selection, assignment sequencing
- Soldier and family support

Within these streams, Arroyo provides expertise and analyses, developed over many years of focused and sustained research at RAND, as well as short-term, quick-response support on critical personnel issues.

The program's FY 2009 research agenda within each of the eight streams is illustrated below.

## FY 2009 Studies in Manpower and Training

### *Recruiting and Personnel Fill Requirements*

■ **Marketing S-Curve Development.** This study identified, analyzed, and compiled evidence about marketing channel effectiveness and used it to develop mathematical models known as S-curves. These models allow the Army to determine the optimal investment range for specific Army national and local lead/awareness sources and the best overall allocation strategy. Sponsored by U.S. Army Training and Doctrine Command.

■ **Improvement of Retiree Recall and ADOS (Active Duty for Operational Support) Programs.** This project identified required upgrades to the ADOS/Retiree recall programs to convert them from legacy, peacetime programs developed to provide limited, short-term relief to Army operations to responsive force multipliers for support of future Army operations. Sponsored by the Deputy Assistant Secretary of the Army (Personnel Oversight).

■ **Recruiting Policies and Entry Level Standards.** This study assessed Army and OSD (Office of the Secretary of Defense) recruiting policies, programs, resources, missions, standards, or measures that may be appropriate to enhance enlisted production and diversity and offset negative trends in enlisted supply through 2015. Sponsored by the Deputy Chief of Staff, G-1 and U.S. Army Accessions Command.

■ **Recruiting and Retention for an Operational Reserve in an Environment of Persistent Conflict for an All Volunteer Force.** This study addressed challenges in recruiting and retention in the Army Reserve that impede its ability to man its formations. It assessed potential management tools and practices to adapt manning processes to support the Army Force Generation (ARFORGEN) readiness cycle, including those to improve recruiting and retention rates for the operational reserve, which will help to fully man the force and improve return on investment. Sponsored by U.S. Army Human Resources Command.

■ **Assessment of the Effects of ARMS (Assessment of Recruit Motivation and Strength) on Increasing Accessions and Reducing Attrition.** This study analyzed recruit

*Researchers in the Manpower and Training Program include (left to right) Michael Hansen, Tom Lippiatt, Major Noah Cloud, Bruce Orvis, Laurie McDonald, and Lieutenant Colonel Kevin Kawasaki. Bruce is the director of the program and Michael is an associate director of the program.*

qualification and ARMS-related screening information following expansion of the ARMS beyond the six initial, experimental sites, to assess accession and attrition rates for recruits who pass existing enlistment screeners versus the ARMS and the reasons for attrition. The study informed the basis for potential longer-term increases in accessions through the ARMS administration and setting ARMS scores sufficient for accession of potential recruits screened out by other criteria. Sponsored by the Assistant Secretary of the Army for Manpower and Reserve Affairs.

■ **Accession Flows Needed to Support ARFORGEN.** This research is helping the Army to fit ARFORGEN-driven recruiting needs with natural accession flows, use delayed entry program management or other policy changes to bridge gaps, ensure flexibility for readiness, maintain recruit quality/potential, and minimize recruiting costs. It also is addressing means to correct military occupational specialty (MOS) flow mismatches and shorten response times for unfilled training seats. Sponsored by the Deputy Chief of Staff, G-1 and the Commanding General, U.S. Army Accessions Command.

### *Reserve Component (RC) Readiness*

■ **Assessing Reserve Component Full-Time Support.** This study helped the Army determine the appropriate amount and type of Full-Time Support (FTS) manpower required to sustain the Reserve Components at desired levels of readiness. Sponsored by the Deputy Chief of Staff, G-8.

■ **Transforming Full-Time Support (FTS) for the Army Reserve.** This study explored approaches to improve FTS to an ARFORGEN-enabled Operational Reserve, focusing first on units that deploy frequently. It examined the FTS capabilities needed to perform "fixed" (steady state) and "variable" (fluctuating) workloads to meet readiness objectives as units move through the ARFORGEN cycle. It also identified key barriers and enablers to transforming FTS. Sponsored by the U.S. Army Reserve.

■ **Sustaining Personnel Readiness in the Operational Reserve.** This study quantified recent levels of personnel stability and turnover, identified trends that may give reason for concern, and traced their effects on unit readi-


*Amy Richardson (center) is co-leading a study of the Army's employer partnership program. Team members include Bryan Hallmark, Major Albert Benson, and co-project leader Ellen Pint (not shown).*

ness for mobilization and deployment. It assessed a range of policy options for managing turnover and personnel readiness, suggesting where the Army should place the greatest management attention and resource investments. Sponsored by the Deputy Chief of Staff, G-3/5/7 and the Deputy Chief of Staff, G-1.

### *Leader Development*

■ **Support to the U.S. Army's Human Capital Strategy Development.** This study provided analytic consultation and support to the Army task force developing the Army's Human Capital Strategy (HCS). It aided in the formulation and specification of that strategy, and in the development of processes for implementation and for monitoring progress. Sponsored by the Deputy Chief of Staff, G-1.

■ **Strategic Management of Senior Leader Competency Development.** This study helped the Army's Senior Leader Development Office (SLDO) refine its strategic management of senior leader competency development. It identified future Army senior leader competency needs; determined the degree to which current development programs can address these needs; and specified the policy, program, and database requirements to support strategic management of critical senior leader competencies. Sponsored by the Office of the Chief of Staff, Army Senior Leader Development.[3]

### *Training*

■ **Monitoring Skill Trends.** This ongoing study has provided the Army with an analytical methodology to identify trends in proficiency on key tasks and skills connected with core and directed Mission-Essential Task Lists (METLs) as well as other selected tasks and skills across the spectrum of operations. It developed mechanisms for collecting data on the trends, and methodologies for analyzing the implications for performance on and continued development and refinement of the tasks. Sponsored by U.S. Army Training and Doctrine Command.

■ **Assessment of Stryker Brigade Combat Team Warfighting Forum Prototype Training Program.** This study examined the effectiveness of the U.S. Army Stryker Brigade Combat Team Warfighters' Forum (SWfF), a prototype for programs to capture information from soldiers returning from deployment and disseminate it to soldiers and leaders in units that are about to deploy. The assessment demonstrated how SWfF is collecting and distributing information from soldier combat experiences and is helping the Army adapt to changing tactical environments. During the course of the study, the researchers made available spin-off products from their work to support ongoing Army training efforts. The results of the study will inform decisions on the manning and funding of Warfighters' Forums; guide the development of new processes for collecting, analyzing, and presenting

[3] This study also informs issues within the Officer Career Fields, Selection, and Assignment Sequencing research stream.

organizational knowledge; and inform ongoing discussions regarding best means for employing WfFs. Sponsored by the Commanding General, I Corps and Fort Lewis.

■ **Assessing the Potential of an Enterprise Approach to Enhance the Army's Training and Leader Development Programs.** This research carried out an evaluative case study to support the Army's efforts to develop a Single Army Training and Leader Development Enterprise (SATLDE) strategy. Sponsored by U.S. Army Training and Doctrine Command and the Deputy Chief of Staff, G-3/5/7.

■ **Assessing Potential Options for Improving the Effectiveness of Advanced Individual Training (AIT).** This study supported the Army's efforts to enhance the effectiveness of AIT by examining the concept of focusing the Army's AIT courses on the set of tasks and skills specifically required for the individual's first unit of assignment. Sponsored by the Deputy Chief of Staff, G-3/5/7.

### *Distance Learning, Simulation Training Development and Application, Training Support Systems*

■ **Technology Approaches to Evaluating the Quality of Army Training.** To support the Army in its broader goal of achieving higher readiness benefit from fielded distributed learning courses, this study developed and tested tools and metrics to document the impact of courses offered by The Army Distributed Learning Program. It advised on the potential for information technology to support efficient collection of metrics and on integrating collection efforts with the Army Training Information System. Sponsored by U.S. Army Training and Doctrine Command.

### *Retention (Active Component and Reserve Component)*

■ **Evaluation of Retention Policies.** This study assisted the Army in identifying adjustments to retention incentives to avoid wasted resources or unacceptably low retention levels and to retain more experienced leadership for the Army's soldiers and units. It evaluated alternative policies to meet challenges posed by operational tempo, deployment requirements, economic trends in the private sector, and the perceived merit of civilian versus military employment. Sponsored by the Deputy Chief of Staff, G-1.

### *Officer Career Fields, Selection, Assignment Sequencing*

■ See Strategic Management of Senior Leader Competency Development, above.

### *Soldier and Family Support*

■ **The Effect of Parental Deployment on Children: Understanding the Impact and Addressing Their Needs.** This ongoing study is assessing the impact that parental deployment has on children's academic performance and school behavior, and is examining the current systems of emotional, behavioral, and mental health support that are available to these children. Where indicated, it has recommended changes to support programs to ensure that they meet the children's needs. Sponsored by the Deputy Assistant Secretary of the Army (Personnel Oversight).

■ **Deployment Cycle Support Process.** This ongoing study is examining the design and effectiveness of the Deployment Cycle Support (DCS) delivery system across the total Army. It is assessing the needs of Army military and civilian personnel and their family members prior to, during, and after mobilization/deployment, and is developing a method for routinely tracking DCS services that are offered and utilized, including an assessment of quality. The study will provide Army leadership data and a decision tool to adjust policies, programs, support structure, and funds to improve the services provided. This could also enhance retention. Sponsored by the Deputy Chief of Staff, G-3/5/7 and the Deputy Chief of Staff, G-1.

■ **Individual Rotation Tempo and Its Effects on Quality of Life and Retention.** This ongoing research is assessing individual rotation tempo and its possible adverse second-order effects, such as effects on family separation, professional development, morale, and attrition/retention. It is evaluating potential changes in first-term length options, post-deployment assignment management, PCS timing, and dwell—and tradeoffs among them—that address these outcomes while meeting ARFORGEN requirements. Sponsored by the Deputy Chief of Staff, G-1 and the Commanding General, U.S. Army Accessions Command.

■ **Participation in the Secretary of the Army's Suicide Task Force.** This study provided sociological expertise on military organization and culture and methodological expertise on studying social issues in the Army to the Secretary of the Army's Suicide Task Force. Sponsored by the Deputy Under Secretary of the Army.

■ **Installation Infrastructure and Services in Support of Army Force Generation (ARFORGEN), Phase 1.** This study examined demands for individual and family support and how these are changing in the face of lengthy, repeated deployments, availability and sufficiency of support services, and alternatives and resource requirements for improving installation services. The study provided an improved understanding of the needs of soldiers and their families, focusing on individual and family readiness and services provided through installations to meet these needs, and collected information that the Army can use to improve the management and resourcing of services. This project was a joint effort with Arroyo's Military Logistics Program. Sponsored by the Assistant Chief of Staff for Installation Management/Installation Management Command. ■

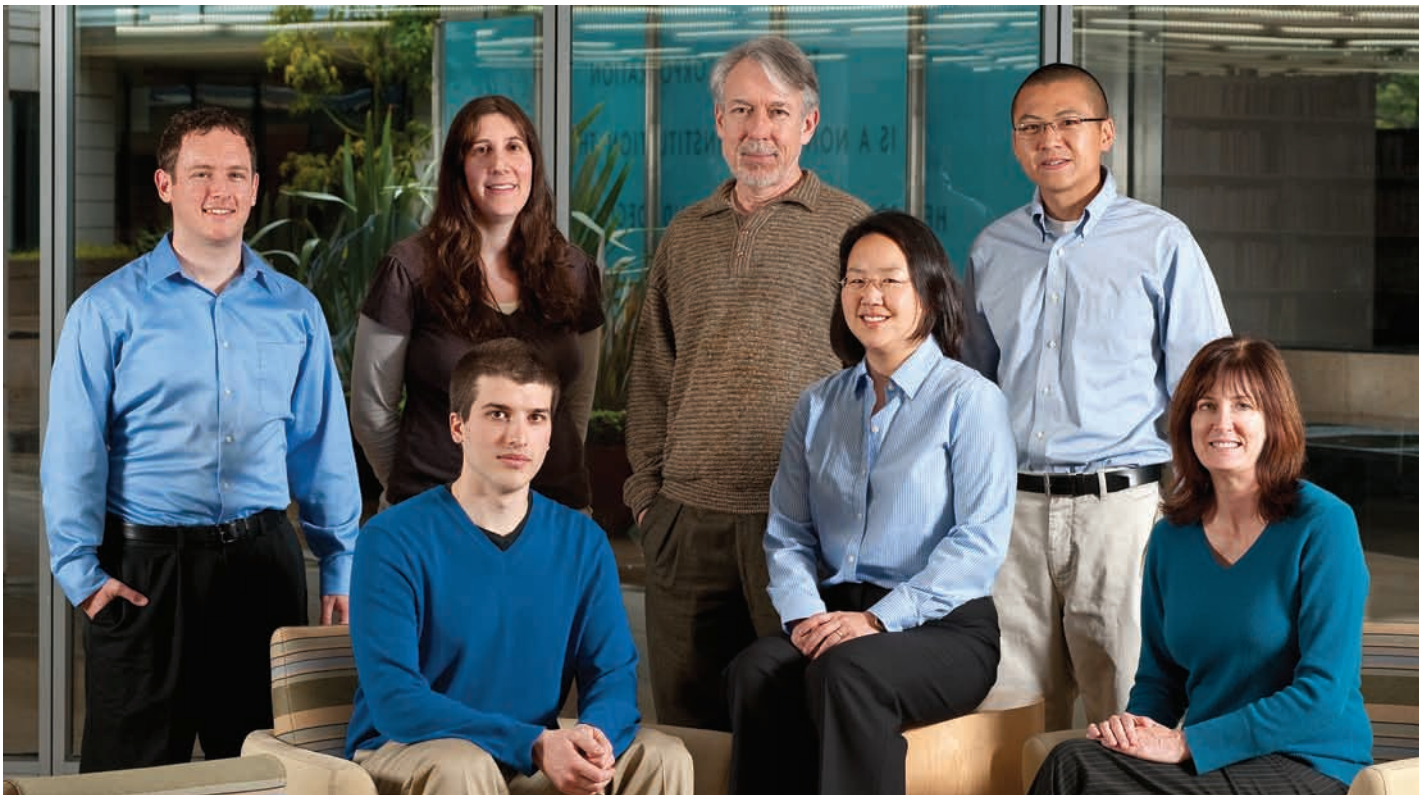

*On April 9, 2009, RAND Arroyo Center hosted a visit to RAND's Santa Monica office by Major General Gregg F. Martin, commanding general of the U.S. Army Maneuver Support Center (MANSCEN) at Fort Leonard Wood. The general presented an overview of MANSCEN to the Arroyo management team, researchers, and Army fellows and spent the day reviewing and discussing recent studies. The Arroyo management team visited Fort Leonard Wood in July to conduct its annual strategic planning meeting. Pictured: General Martin and Tim Bonds.*

# Military Logistics Program

## Mission and Research Streams

RAND Arroyo Center conducts analyses to help the Army improve support to operational forces, enhance the effectiveness of its business processes, and optimize the industrial base and support infrastructure. At the strategic level, research on military logistics helps the Army to develop both a compelling vision of future support capabilities and an effective strategy for executing the vision. In accordance with the vision, Arroyo develops and evaluates alternatives in major logistics policy areas: (1) institutional Army and Joint operational support policies, processes, and structures; (2) industrial base policies and structures; and (3) fleet management planning. Arroyo also identifies and evaluates improvements to logistics processes that will enhance performance and deployability or will reduce costs while maintaining or even improving effectiveness, and provides analytic support to Army implementation efforts. These improvements include changes in financial management policies and processes that would improve the effectiveness and responsiveness of the Army's logistics processes. In all these areas, Arroyo draws on extensive research capital to provide timely short-term analytic assistance to senior decisionmakers on urgent logistics issues.


*Eric Peltz (center) directs the Military Logistics Program. Lisa Colabella (standing left) led a team that studied the Army's use of theater provided equipment. Team members included Major Mathew Guerrie (standing) and Matt Lewis and Aimee Bower (seated).*



*Carol Fan (seated center) and Elvira Loredo (not shown) are leading a study to improve the Army's inventory management of organizational clothing and individual equipment. Team members include (standing left to right) James Broyles, Candice Miller, Rick Eden, Jason Eng, and (seated to the left and right of Carol) Evan Greene and Patricia Boren. Rick is the associate director of the Military Logistics Program and the research quality assurance manager for RAND Arroyo Center.*

To accomplish its mission, the program sustains research streams in four policy domains:

- Supply chain management
- Fleet management and modernization
- Logistics force development
- Infrastructure management

The program's FY 2009 research agenda within each of these streams is illustrated below.

## FY 2009 Studies in Military Logistics

### *Supply Chain Management*

■ **Direct Vendor Delivery Performance Assessment and Improvement.** This study assessed Defense Logistics Agency (DLA) direct vendor delivery (DVD) performance for supply classes II, IIIP, IV, and IX with respect to Army customer expectations, determined the root causes of shortfalls, and developed recommendations to address these causes and correct shortfalls. Sponsored by the Deputy Chief of Staff, G-4.

■ **Authorized Stockage List (ASL) Expert Team Support.** This continuing study provided ASL recommendations on a quarterly basis for supply support activities (SSAs) in Southwest Asia, on a biannual basis for SSAs in Europe and Korea, and for other SSAs upon request as part of the Army Materiel Command (AMC) central ASL expert team in accordance with the current G-4, Department of the Army ASL policy. It also recommended retention levels both at the tactical SSAs and at theater level. The study team worked with AMC to transition the ASL methodologies and capabilities to a new internal AMC team. Sponsored by the Deputy Chief of Staff, G-4 and Army Materiel Command.

■ **Theater Inventory and Forward Distribution Depot (FDD) Usage Optimization Support.** This study expanded FY 2008 Arroyo analyses of the theater support structure in Southwest Asia to evaluate how the Army can most effectively utilize Defense Logistics Agency (DLA) forward distribution depots to reduce costs and improve support performance on a global basis. It conducted quarterly FDD inventory reviews for AMC implementation

and for Army reviews of DLA and GSA (General Services Administration) inventory management because both greatly affect Army transportation costs. Sponsored by the Deputy Chief of Staff, G-4 and Army Materiel Command.

■ **Analytical Support to the Global Combat Support System (GCSS)–Army Prototype at Fort Irwin.** This study assisted in the continued development of the demand analysis capability within the GCSS-Army F/T (Field/Tactical) being evaluated at the supply support activity supporting the 11th Armored Cavalry Regiment at Fort Irwin. This assistance included recommendations for potential improvement. Sponsored by the Deputy Chief of Staff, G-4.

■ **Improving Organizational Clothing and Individual Equipment (OCIE) Inventory Management.** This study developed recommendations to improve the inventory management of the Army's OCIE. It took a comprehensive approach and developed findings and recommendations in the areas of inventory planning, warehouse management, item information management, information systems, and replenishment support. The project team initiated a pilot adopting many of these recommendations at an Army installation. Sponsored by the Deputy Chief of Staff, G-4 and Army Materiel Command.

■ **Supply Chain Risk Management (SCRM).** This study developed recommendations to improve the effectiveness of Army sustainment SCRM based upon identifying gaps between the Army's current SCRM practices and leading commercial practices. Sponsored by Army Materiel Command.

■ **Improving War Reserve Secondary Item (WRSI) Processes.** This study assisted with Army efforts to review and improve the overall WRSI management process, to include requirements determination, resource allocation, execution, storage, and stock rotation. The study team worked with Army personnel to refine the new WRSI methodology developed and applied by Arroyo to guide the execution of FY 2008 WRSI funding. The study produced specific recommendations for reposturing Army prepositioned stock outside the continental United States. Sponsored by the Deputy Chief of Staff, G-4.

■ **Assessment of U.S. Central Command (CENTCOM) Medical Distribution Structure.** This study evaluated whether changes in the CENTCOM medical supply distribution structure would lead to decreased costs and/or improved performance of the theater health service support system. Sponsored by U.S. Army Medical Research and Materiel Command.

■ **Adapting Secondary Item Repair Planning to Pull Production.** This study developed a framework for Army Material Command to move to pull production for the depot-level repair of secondary items. Sponsored by the Deputy Chief of Staff, G-4 and Army Materiel Command.

### *Fleet Management and Modernization*

■ **AMEDD's Equipping and Maintenance Solution to ARFORGEN.** This study developed and evaluated options (including current plans) for an equipping and maintenance strategy to ensure that the Army's Combat Support Hospitals have the equipment they need for missions and training throughout the ARFORGEN cycle. Sponsored by the Office of the Surgeon General/U.S. Army Medical Command.

■ **Effects of Theater Provided Equipment (TPE).** This study was designed to inform the development of an Army TPE policy—levels, types, and management practices—that would be most likely to maximize the operational readiness benefits and minimize the costs (monetary and/or nonmonetary) associated with TPE. Sponsored by Deputy Chiefs of Staff, G-4 and G-8.

■ **Improving the Property Accountability Process.** This study determined how the Army can improve property visibility and accountability for end items (i.e., Class VII and/or accountable items) as units move through the phases of the ARFORGEN readiness cycle. Sponsored by the Deputy Chief of Staff, G-4 and Army Materiel Command.

### *Logistics Force Development*

■ **Logistics Roles for Unmanned Aircraft Systems.** This study determined the benefits, technical feasibility, and cost of integrating unmanned aircraft systems (UAS) into logistics activities and operations and compared them to other options to determine where UAS might have advantages. Sponsored by the Deputy Chief of Staff, G-4 and Combined Arms Support Command.

■ **Army Special Operations Forces (ARSOF) Logistics Support Requirements.** This study assessed the adequacy of organic and direct support logistics support (to include field health support) to ARSOF and interoperability with theater logistics capabilities. It developed options for addressing any identified shortfalls across DOTLMPF

domains. Sponsored by U.S. Army Special Operations Command.

### *Infrastructure Management*

■ **Long-Term Depot-Level Maintenance Capability Needs and Options.** This study identified long-term challenges faced by the Army depots, examined how they are related to the current policies and practices of depot-level maintenance, and provided potential avenues to address the challenges. Sponsored by Army Materiel Command.

■ **Installation Infrastructure and Services in Support of Army Force Generation (ARFORGEN), Phase 1.** This study examined demands for individual and family support and how these are changing in the face of lengthy, repeated deployments, availability and sufficiency of support services, and alternatives and resource requirements for improving installation services. The study provided an improved understanding of the needs of soldiers and their families, focusing on individual and family readiness and services provided through installations to meet these needs, and collected information that the Army can use to improve the management and resourcing of services. This project was a joint effort with Arroyo's Manpower and Training Program. Sponsored by the Assistant Chief of Staff for Installation Management/Installation Management Command.

■ **External Trends for Army Installations 2025.** This study identified external Army trends that may affect the Army's ability to provide quality installation services and infrastructure and that the Army should consider in its strategic installation planning. Sponsored by the Deputy Assistant Chief of Staff for Installation Management.

■ **Capability Improvement Options for Defense Distribution Depot, Oklahoma City (DDOO).** This study supported Army, Defense Logistics Agency, and Air Force senior leaders in developing an agreed-upon strategy for support of central United States customers by the Strategic Distribution Platform at DDOO in the 2013-and-beyond timeframe. Sponsored by the Deputy Chief of Staff, G-4. ■

# Arroyo Military Health Policy Research

## Mission and Research Streams

Arroyo Military Health Policy Research, a joint initiative with RAND Health, conducts analyses designed to ensure that the medical readiness and health benefit missions of the Army are carried out effectively and efficiently. This includes studies of policies and programs for enhancing health promotion and providing care on the battlefield, in garrison, and in Army medical facilities. Through this initiative, Arroyo has the capability to estimate the health-related impacts of deployment on soldiers and their families and assess programs to alleviate these impacts, examine the appropriateness and quality of health care, and provide analytic support to health care improvement initiatives. Arroyo has experience in developing and evaluating alternative policies to reduce the costs of health care and improve the productivity of Army providers, as well as assessing the medical readiness of soldiers and programs. Additional capabilities include evaluating the implications of advances in medical technology, and contributing toward analyses of the requirements for medical personnel in the full spectrum of future demands, including combat support, nation building, humanitarian, and disaster response operations.

Arroyo sustains research streams in four policy domains:

- Health promotion, risk reduction, and prevention
- Availability, appropriateness, and quality of health care
- Cost and structure of health benefits
- Management and productivity of providers

Maintaining expertise in these domains also allows Arroyo to provide timely short-term assistance on issues of importance to the Army.


*Adam Resnick (seated right) leads a research team studying the health care needs of Army beneficiaries. Team members include (left to right) Major Keith Palm, Ellen Pint, Mark Friedberg, Nicole Eberhart, Lieutenant Colonel Floreyce Palmer, and Sue Hosek (not shown).*

*Chip Leonard (left) is an associate director of the Manpower and Training Program; in FY 2009 he also served as acting deputy director of RAND Arroyo Center. Terri Tanielian (center) is co-director with Sue Hosek (not shown) of Arroyo's Military Health Policy Research initiative. Katherine Harris (right) is leading a project on the psychological effects of rapid rotational deployments.*

The Arroyo Military Health Policy Research agenda for FY 2009 within these streams is illustrated below.

## FY 2009 Studies in Military Health Policy

### *Health Promotion, Risk Reduction, Prevention*

■ **Defining and Measuring Family Readiness.** This multiyear study will identify the antecedents and consequences of family readiness by collecting longitudinal data from Army families across the deployment cycle. Sponsored by the U.S. Army Surgeon General.

■ **Addressing the Psychological Health and Behavioral Effects of Army Force Generation (ARFORGEN) and Operational Tempo (OPTEMPO): Phase 1.** This study is helping the Army to develop a comprehensive and accurate description of the effects of ARFORGEN, deployment tempo, operational tempo more generally, and transformation activities (e.g., modularity) on soldier and family health-related outcomes and how these outcomes are affected in conjunction with other outcomes (such as readiness). Sponsored by the U.S. Army Surgeon General.

### *Availability, Appropriateness, and Quality of Health Care*

■ **ARFORGEN (Army Force Generation) and the Ability of Army Medical Treatment Facilities (MTFs) to Meet Beneficiary Health Care Needs: Phase 1.** This study is helping the Army develop a comprehensive description of the side effects of deployment and operational tempo and transformation activities on the ability of Army MTFs to meet the health care needs of soldiers and families. It will also assess how families' needs vary over the ARFORGEN cycle and how well the MTF services integrate with services provided by TRICARE civilian providers. Sponsored by the U.S. Army Surgeon General. ■

SECTION 3

# Summaries of Selected FY 2009 Studies

This section of the annual report provides summaries of seven studies completed in FY 2009:

- **Can the Army Deploy More Soldiers to Iraq and Afghanistan?**
- **Enhancing Civilian Agency Participation in Stability Operations**
- **Preparing for "Hybrid" Opponents: Israeli Experiences in Lebanon and Gaza**
- **Human Capital Strategy for the Army's Human Resources Command**
- **Assessment of Interactive Multimedia Instruction (IMI) Courseware Can Enhance Army Training**
- **The Advantages and Disadvantages of Seeking Commonality in Military Equipment**
- **What Should Be Stocked in War Reserve? A New Method for Allocating Resources**

# Can the Army Deploy More Soldiers to Iraq and Afghanistan?

**Key Points**

- **Most of the Army's active-duty soldiers have deployed, many for the second or third time.**
- **To meet demand, the Army has sped up troop rotations to make more soldiers available.**
- **The Army retains very limited capacity to deploy additional active-duty soldiers.**

In October 2008, the Vice Chief of Staff of the U.S. Army asked RAND Arroyo Center to assess the demands placed upon the Army by deployments to Operation Enduring Freedom (OEF) in Afghanistan and Operation Iraqi Freedom (OIF) in Iraq. This request coincided with some public statements concerning the Army's capacity to deploy additional soldiers to OEF and OIF.

To give the Army and other policymakers a fresh look at Army deployments, RAND analyzed data from the Department of Defense's (DoD) Defense Manpower Data Center (DMDC), which tracks personnel involved in contingency operations. Arroyo's analysis addressed three broad issues: the number of soldiers who have deployed to date; the ratio of soldiers' deployed time to nondeployed time; and the number of soldiers who have not yet deployed and the reasons they have not.

## Most Active-Duty Soldiers Have Deployed at Least Once

As of December 2008, the Army has provided over 1 million troop-years to OIF and OEF. Active-duty soldiers alone have contributed over 700,000 troop-years to these two wars. From September 2005 through December 2008, the Army had an average of 128,000 soldiers deployed to OIF and OEF.

Although the Army represented 40 percent of the DoD's active-duty strength in 2008, it provided 52 percent of the forces in Iraq and Afghanistan. Active-duty strength equals the sum of active component end strength, and those reserve component soldiers on full-time active-duty status—as distinct from mobilized reservists. Thus, the Army is sending a much higher proportion of its active-duty soldiers to the ongoing wars than the other services.

To accumulate this much deployed time, most active-duty soldiers in the Army (67 percent) have deployed—and most now deployed are on their second or third tour. Multiple tours have created an increasingly experienced force in OEF/OIF. Figure 3.1 reflects the cumulative deployments for each service as of December 2008. The numbers around the outside circle (proceeding in a clockwise direction) depict cumulative months deployed, and the rings (moving outward in a radial direction) depict the number of service members who have been deployed for that period of time. For example, 27,000 soldiers had a cumulative deployment time of 13 months; 35,000 had accumulated 15 months.

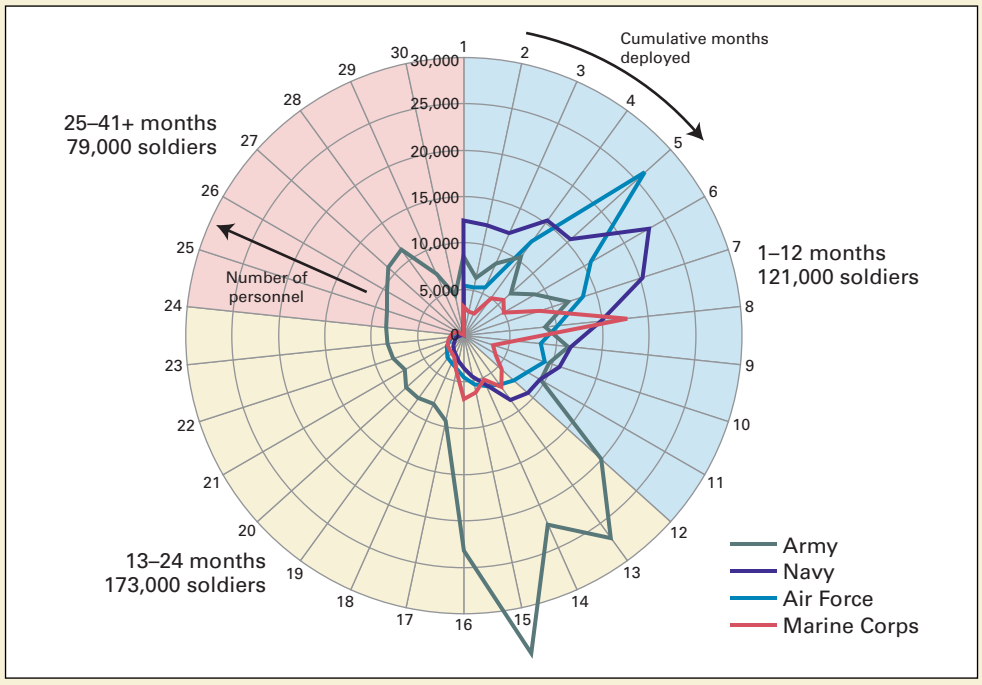
As of December 2008, approximately 373,000 soldiers in the Army had served in OIF or OEF; 173,000 soldiers are working on their second year of deployed time and 79,000 are working on their third year or longer. Of this last group, over 9,000 are deploying for their fourth year.

## The Army Has Sped Up Troop Rotations to Make More Active-Duty Soldiers Available

The demand for active-duty soldiers in OEF and OIF would have exceeded supply under the Army's normal

The research summarized here is published in Timothy M. Bonds, Dave Baiocchi, and Laurie L. McDonald, *Army Deployments to OIF and OEF*, Santa Monica, CA: RAND Corporation, DB-587-A, 2010. http://www.rand.org/pubs/documented_briefings/DB587/

**Figure 3.1**
**A Significant Number of Soldiers Are Entering Their Third Year of Cumulative Deployed Time in OIF and OEF**




## The Army Retains Very Limited Capacity to Deploy Additional Soldiers

Despite the increased rate at which soldiers deploy, the Army retains very limited capacity to deploy additional soldiers to OIF and OEF. As of December 2008, 184,000 out of 557,000 active-duty soldiers had not yet deployed:

- The majority of these, 109,000, are new soldiers; roughly another 4,000 are cadets at the U.S. Military Academy.
- Over 10,000 are soldiers forward-stationed in Korea, Europe, or other overseas locations who have not yet served in OIF or OEF.
- Another 27,000 are in military occupational specialties that support the current war efforts or other contingency missions (e.g., in medical or intelligence related positions), but are not located within Iraq or Afghanistan.
- Of the remaining 34,000 soldiers, about 3,000 have been injured prior to deployment and are in warrior transition units.

This leaves approximately 31,000 soldiers (about 5.6 percent of the active-duty force) who are possibly available for deployment.

In summary, this analysis suggests that the active-duty Army is almost completely utilized (about 94 percent) and retains very little unutilized capacity to deploy additional active-duty soldiers. Virtually all of the Army's currently serving soldiers have either already deployed to OIF/OEF at least once (67 percent) or simply have not served long enough to get deployed (20 percent). The remaining 13 percent is made up of soldiers who in most cases simply have not had an opportunity to deploy to OIF/OEF because they have been needed elsewhere, or who have been injured before having the chance to deploy. Less than 6 percent of active-duty soldiers are potentially available for deployment. ■

deployment policies, so the Army acted to increase supply: it increased the overall size of the active component; reassigned soldiers from other missions to the pool of soldiers rotating to OEF and OIF; and increased the rate at which soldiers rotate to and from the wars.

The DoD measures the rate at which soldiers deploy using a "BOG: Dwell ratio." A 1:1 BOG:Dwell ratio indicates that a soldier spends one time period (typically a year, and sometimes up to 15 months) in theater ("BOG" or "boots on ground"), and the same amount of time not in theater ("Dwell") before returning to theater. A 1:2 ratio indicates two time periods away from theater for every time period in theater, and a 1:3 ratio yields three time periods away from theater for every time period in theater. The DoD goal for the active component is a BOG:Dwell ratio of 1:2.

To maintain the number of soldiers needed in theater, the Army has deployed soldiers at BOG:Dwell ratios between 1:1 and 1:2, and closer to 1:1, for much of the period from 2003 to 2008. The BOG:Dwell ratios the Army has sustained in OIF and OEF show that soldiers have deployed more often than the DoD goal of 1:2 for the active component. However, until recently, demand has increased as quickly as the number of available soldiers, so that there was no net easing of the deployment ratio.

# Enhancing Civilian Agency Participation in Stability Operations

**Key Points**

- **Only a limited number of government civilian agencies need to be involved in planning stability operations.**
- **Civilian agencies are capable but lack capacity.**
- **Collaboration is impeded by structural problems that center on incentive issues.**
- **Real solutions must take place at national level, but DoD and the Army can take some steps to improve collaboration.**

Stability operations (encompassing stabilization, security, transition, and reconstruction) are intended to prevent or halt the deterioration of security, economic, and/or political systems; establish a safe environment for the local populace; shift responsibility for security, services, economic development, and governance from the intervening military and civilian agencies to the host nation; and rebuild degraded, damaged, or destroyed infrastructure.

The U.S. plans for stability operations emphasize a "whole of government" approach in which civilian and military agency efforts reflect a common U.S. strategy, though such an approach has been difficult to implement in practice. The Army asked RAND Arroyo Center to assess the problems of civilian capacity for stability operations and to identify options for making key civilian agencies more capable partners to the Army in such operations.

The research summarized here is published in Thomas S. Szayna, Derek Eaton, James E. Barnett, II, Brooke Stearns Lawson, Terrence K. Kelly, and Zachary Haldeman, *Integrating Civilian Agencies in Stability Operations*, Santa Monica, CA: RAND Corporation, MG-801-A, 2009. http://www.rand.org/pubs/monographs/MG801/

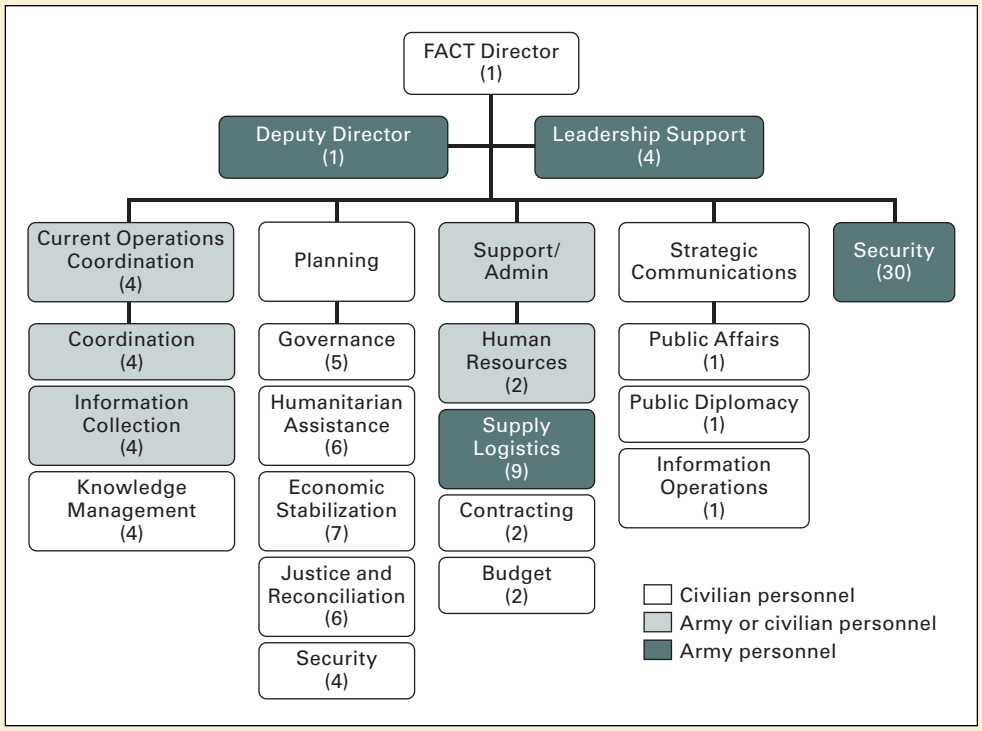
## Essential Civilian Agencies for Planning for Stability Operations

The Arroyo researchers identified the main civilian agencies for strategic-level planning of stability operations by linking the major categories of stability operations tasks to the U.S. civilian agencies that have expertise in these tasks. The U.S. Agency for International Development (USAID) is the necessary partner, as it is the only major U.S. government organization that focuses solely on international capacity building and development. The U.S. Department of State is the other main partner, focused on the rule of law and democracy building. Specific agencies within the Departments of Justice, Treasury, and Agriculture also play key roles in strategic-level planning for stability operations.

## Capabilities Required at the Tactical Level

Drawing on the experiences of Provincial Reconstruction Teams carrying out stability operations in Afghanistan and Iraq, Arroyo researchers identified mission-essential tasks of proposed tactical-level interagency teams (Field Advance Civilian Teams, or FACTs) that would support the efforts of legitimate local governments to build public institutions that can deliver public goods and services. They compiled these tasks into occupational groups, identified appropriate civilian occupations, and then located required skills using federal personnel databases. The researchers proposed a basic FACT structure that has organic functional and organizational capabilities (see Figure 3.2).

**Figure 3.2**
**Proposed FACT Structure**




## Civilian Agencies Have Limited Capacity

Although civilian agencies have most of the skills required for large-scale, complex stability operations, they lack sufficient capacity. For example, most personnel with stability-relevant expertise in civilian agencies cannot be redeployed for stability operations contingencies without damaging current domestic commitments. Unlike the military services, civilian agencies are focused on steady-state operations, which call for continuous full employment of resources and leave little slack in the system. Moreover, stability operations are outside the main institutional goals of domestically focused civilian agencies, and even for agencies having an international orientation, participation in stability operations may be tangential.

## Structural Problems Require National-Level Solutions, but the Army Can Enhance Collaboration

Addressing the low collaborative capacity for stability operations can take place only at the national level, since the basic problems are deeply structural and inherent to the way public organizations function in the United States. The federal public administration system needs to address the basic incentive problem that currently hinders cross-agency collaboration. An interagency "Goldwater-Nichols Act" might strengthen the links across agencies with a role in the national security policy realm. Other options include increasing stability-related personnel of the Department of State and USAID, funding and training the civilian response corps, holding civilian agencies accountable for stability operations efforts, and establishing a standing interagency planning capability for stability operations. The DoD could improve interagency collaboration by mitigating problems stemming from misaligned incentive structures, including institutionalization of cooperative venues and exercises that can fully integrate civilian assets.

The Army could take steps to increase collaboration with civilian agencies by increasing interaction, providing appropriate planning expertise, and easing the challenges of organizational change. For example, at the headquarters level, the Army could create horizontal links to build habitual connections and foster relationships between civilian and Army stability-related planners and organizations, reassess information-sharing policies to improve access, and assess the support it will need to provide to the proposed FACTs. The Army could also enhance its own Civil Affairs Branch by establishing additional active civil affairs planning teams, making such teams available to critical contingency-specific civilian organizations, embedding properly trained civil affairs planners in civilian organizations with stability-related expertise, and increasing the number of active-duty strategic and operational Civil Affairs planners and specialists within the Army's force structure. ■

# Preparing for "Hybrid" Opponents: Israeli Experiences in Lebanon and Gaza

**Key Points**

- **The basics of joint combined arms fire and maneuver are necessary for successful operations against "hybrid" opponents.**
- **The ability of an adversary to transition from irregular to hybrid is relatively simple, requiring only the sponsorship of a state actor able to provide sophisticated weapons and training.**
- **Precision, standoff fires are critical, but not sufficient, to cope with hybrid opponents.**
- **Heavy forces—based on tanks and infantry fighting vehicles—are key elements of any force that will fight hybrid opponents.**

The U.S. military was largely designed for major combat operations against state actors, but over the past several years it has made significant changes to its training, organizing, and equipping paradigms to adapt to nonstate, irregular threats in Afghanistan and Iraq. The adversaries in both of these wars have yet to employ sophisticated weaponry (such as man-portable air defense systems or anti-tank guided missiles) in any significant numbers. The introduction of such weapons could radically escalate the challenges faced by U.S. forces. All that is needed for the Taliban to make the transition to a more lethal adversary is a state supplier of advanced weapons and training in their use.

Under these conditions, the U.S. Army might be approaching a situation similar to that of the Israelis in 2006 before the Second Lebanon War, when it faced a hybrid threat, defined as an "*adversary that simultaneously and adaptively employs a fused mix of conventional weapons, irregular tactics, terrorism and criminal behavior in the battle space to obtain [its] political objectives.*"[4] To better understand the breadth of challenges that could affect U.S. decisions about future military capabilities, RAND Arroyo Center researchers examined the recent experiences of the Israel Defense Forces (IDF) in Lebanon and Gaza.

## The Second Lebanon War: A Wake-Up Call

Israel's strategic assessment prior to 2006 was that low-intensity, asymmetric operations would be the main role of its army in the future. Israeli leaders had concluded that the air force would deter state adversaries and the army reserves would have time to mobilize and train in the unlikely event of a war with a bordering state, a possibility further mitigated by the U.S. presence in Iraq. Based on this assessment, budgets were cut; armored unit training, deemed largely irrelevant in low-intensity conflict, was neglected; the staffs and processes within the IDF that integrated air and ground operations were removed from brigades; and little training was done in air-ground integration.[5]

Focused almost exclusively on irregular combat, the IDF became generally incapable of the joint combined arms fire and maneuver capabilities associated with major combat

The research summarized here is published in David E. Johnson, *Military Capabilities for Hybrid War: Insights from the Israel Defense Forces in Lebanon and Gaza*, Santa Monica, CA: RAND Corporation, OP-285-A, 2010. http://www.rand.org/pubs/occasional_papers/OP285/

[4] Frank G. Hoffman, "Hybrid vs. Compound War, the Janus Choice: Defining Today's Multifaceted Conflict," *Armed Forces Journal* (October 2009), p. 15. Emphasis in the original.

[5] The Winograd Commission, *The Second Lebanon War*, Final Report, Volume I, January 2008, and discussions with IDF officers in Tel Aviv, February 10–12, 2009; in Washington, D.C., February 26, 2009, and April 1, 2009; and in Tel Aviv and Latrun, September 2–10, 2009.

operations. However, as demonstrated in the Second Lebanon War, taking a defended position from a hybrid force armed with standoff fires (such as anti-tank guided missiles) requires forces trained and organized for fire and maneuver, albeit at a reduced scale from major combat operations.

Although relatively small, Hezbollah units in 2006 were trained, organized, and armed with sophisticated weapons, including anti-tank guided missiles, middle- and long-range rockets, and man-portable air defense systems. Initially, the IDF tried to decide the issue with standoff air and artillery attacks, but this did not stop short-range rocket attacks on Israel, nor result in the return of the soldiers whose capture had precipitated the war. Eventually, Israeli ground forces entered Lebanon. Conditioned for low-intensity conflict, they encountered real difficulties when they confronted Hezbollah and paid a heavy price in casualties for their lack of preparation for a hybrid opponent. The IDF's reputation as an invincible military—fundamental to deterrence—was also tarnished.

## Operation Cast Lead: Back to Basics

With a renewed appreciation for the importance of ground forces, the IDF went "back to basics" in the aftermath of the 2006 conflict, training extensively on high-intensity combat skills, particularly combined arms fire and maneuver. Before the Second Lebanon War, roughly 75 percent of training was on low-intensity combat and 25 percent on high-intensity combat; after Lebanon, this ratio was reversed. In recognition of the importance of heavy forces, production of Merkava IV tanks was also resumed, as was armored force and reserve training. As a result, when the IDF went into Gaza in December 2008 to reduce the number of rocket attacks launched from Gaza and restore Israel's military deterrent—Operation Cast Lead—it was markedly better prepared to fight a hybrid opponent.

As opposed to the Second Lebanon War, a ground campaign and reserve mobilization were planned for Operation Cast Lead from the beginning. The air force hit key targets in Gaza, and IDF artillery and air strikes "paved the way by fire" for ground maneuver by brigade combat teams, hitting Hamas positions and detonating mines and improvised explosive devices (IEDs). IDF engineers used armored D-9 bulldozers to cut paths through remaining IEDs. The firepower that preceded the ground attack, coupled with the rapidity of the maneuver, surprised Hamas, and it was driven from its prepared positions back to improvised positions. Heavy armored units were also a key component of the operation, providing protected, mobile precision firepower and intimidating the enemy. Although the IDF did not put a complete halt to rocket launches out of Gaza into Israel, it was able to reduce them. More importantly, the IDF demonstrated its renewed competence in air-ground operations, a key to restoring its military deterrent.

## The "Middle" Range of the Range of Military Operations

The Israeli experience makes apparent that there are opponents at three basic levels of military competence, and each level places different demands on the military forces being designed to confront them. What is especially important to note about these levels is the relative ease of transitioning from a nonstate irregular capability to a state-sponsored hybrid capability. All that is needed is a state sponsor to provide weapons and training to irregular forces. The United States itself created such a transition in Afghanistan in the 1980s when it gave Stinger missiles to the Mujahideen, turning them from an irregular force to a hybrid adversary that unhinged Soviet strategy in Afghanistan.

## Policy Issues

The imperative to conduct protracted low-intensity operations with limited ground forces in Iraq and Afghanistan has atrophied the skills and processes for integrated air-ground-ISR operations in both the U.S. Army and the U.S. Air Force. The Israeli experience points to the need for further analysis in at least several areas to enhance readiness:

- The air-ground-ISR integration implications (in organizations, C2 technologies, and procedures) of operations against hybrid opponents, particularly when they are operating "among the people."
- The training implications of hybrid opponents for U.S. units (i.e., individual and collective skills that are different from those employed in irregular warfare or major combat operations).
- The kinds of ground combat vehicle capabilities—in the realms of survivability, lethality, and mobility—required to prevail against hybrid opponents. ■

# Human Capital Strategy for the Army's Human Resources Command

**Key Points**

- **Human Resources Command (HRC) has been directed to move to Fort Knox, Kentucky, and reduce its staff by about one-third.**
- **Many of HRC's professional staff will likely not relocate.**
- **Finding staff with the right skills in the new location will be difficult.**
- **HRC needs to develop a long-term recruiting, development, and management strategy.**

The 2005 Base Realignment and Closure (BRAC) legislation directed the Army to move Army Human Resources Command (HRC) from its locations in Alexandria, Virginia, Indianapolis, Indiana, and St. Louis, Missouri to Fort Knox, Kentucky and to consolidate all functions there by September 2011. Additionally, the Department of the Army directed a 30 percent reduction in HRC's staff, requiring reorganization of the command. RAND Arroyo Center was asked to examine HRC's ability to meet the Army's military personnel demands with a modified organizational structure in its new location. Arroyo identified numerous complications arising from the reduced organizational structure. Many of the complications centered on shortfalls in the kinds of staff expertise required to handle difficult issues occurring in a new organizational context. In light of the difficulties these shortfalls would eventually pose for HRC and the Army, HRC asked Arroyo to help resolve the problem.

## Research Tasks and Approach

To identify the competencies required by personnel at each level of HRC (executive, senior, and line levels), Arroyo developed personnel competency models for those positions that would survive HRC's reorganization. Arroyo also did a "gap analysis" of differences between competencies that key HRC staff would need to have in the future and HRC's ability to address them over the near and longer terms (i.e., beyond 2012), in terms of skill and manpower availability in the greater Fort Knox area. Arroyo researchers also developed training concepts to close gaps between the future workforce's competency needs and the availability of these skills, taking the new location and organizational structure into account. To ascertain what competencies might be required in the new organization, Arroyo researchers crafted 150 survey questions related to HRC competencies identified in the professional literature and in interviews with HRC staff. These questions were subsequently posed in a web-based survey. Competencies required for effectiveness in respective positions, associated proficiency levels, and the types of education, training, and work experience perceived as required were all surveyed, with a response rate of 68 percent.

## Findings

The research led to the following three findings.

- **Competency and proficiency demands will hold constant.** Analysis found that, with two exceptions, HRC can expect no changes in the demands for competencies or proficiencies in the future. The two exceptions were (1) management of Army Reserve and Army National Guard readiness and deployment, and (2) merged man-

The research summarized here is published in Ralph Masi, Anny Wong, John E. Boon, Jr., Peter Schirmer, and Jerry M. Sollinger, *Supporting the U.S. Army Human Resources Command's Human Capital Strategic Planning*, Santa Monica, CA: RAND Corporation, MG-828-A, 2009. http://www.rand.org/pubs/monographs/MG828/

agement of enlisted and officer personnel. Nevertheless, HRC is likely to lose a significant share of its experienced staff in the process of moving to Fort Knox, and their knowledge and experience will have to be replaced.

- **It will be difficult to meet workforce demands in the Fort Knox area.** Gap analysis subsequently showed that it will be difficult for HRC to meet its near-term (2010–2012) workforce quantity and quality demands in the Fort Knox area, both because the demands will be high and because the supply in some areas will be low. HRC's estimates indicate that fewer than 40 percent of current incumbents will likely move to Kentucky. Furthermore, 40 percent of the current workforce is also eligible for retirement by 2010, and an additional 30 percent is eligible for early retirement by the same date. Low retention's effects on meeting workforce demand are compounded by the finding that the Fort Knox area is not a promising recruiting ground. Extensive field and archival research into the Fort Knox area labor market indicated that industries located there struggle despite extensive recruiting plans and actions and that civil service hiring rules make the problem more difficult for the Army.
- **Ensuring a fully staffed and competent HRC workforce beyond 2010 will require long-term recruiting, development, and management strategies.** These efforts will need to be greater than those initially envisioned by HRC. HRC will need different near- and long-term approaches, including prioritized retention strategies, national searches, and targeted recruiting at Fort Knox. The overall process should emphasize first narrowing quantitative and qualitative gaps in the workforce in the near term (between 2010 and 2012), and then closing them by 2013 and beyond; this occurs as the workforce stabilizes and more and more workers gain required competencies and associated proficiency levels. Associated actions must begin presently, however, and be in consonance with a clear, well-resourced institutional human capital strategy. This strategy, with modifications as appropriate along the way, should carry HRC from the present through 2013 and beyond.

## Recommendations

The findings led Arroyo researchers to make four recommendations. First, HRC should formulate an institutional human capital strategy to provide a coherent framework to guide marketing, hiring, training, performance evaluation, and other activities designed to create, develop, and retain a new workforce. Development and implementation of this strategy should begin now. Designation of an executive-level staff agent to lead the development of its human capital strategy is essential. HRC would further profit by designating a Chief of Training and Staff Development at this crucial time, to integrate personnel competency requirements into training activities across the organization and to work with HRC supervisors and employees to determine staff development needs and strategies.

Second, HRC should use personnel competency modeling results from Arroyo research to determine competency and proficiency requirements. Setting down these requirements will aid HRC in developing training curricula, defining specific job requirements, and enhancing the ability of supervisors to evaluate worker performance and make recommendations for staff development.

Third, HRC's plan for a new training framework should rest on four concepts. Specifically, HRC must (1) narrow quantitative and qualitative gaps over the short term (from 2010 to 2012), (2) close those gaps over the longer term (beyond 2012), (3) use outcome-driven, competency-based recruiting, training, and evaluation, and (4) conduct continuous training, evaluation, and upgrading of skills to build long-term workforce capacity and stability.

Fourth, HRC should partner with Kentucky's educational institutions to produce the necessary competencies. With adjustments by HRC as appropriate, the approach should provide a basis for operational specifications of competencies and proficiency levels, as well as means to attain them. ■

# Assessment of Interactive Multimedia Instruction (IMI) Courseware Can Enhance Army Training

**Key Points**

- **Distributed learning (DL) is the key to the Army's training strategy, but there are no systematic program-level assessments of DL effectiveness.**
- **RAND Arroyo Center developed an approach to evaluating DL courseware that reveals strengths and needs for improvement in technical features and instructional design.**
- **This method is cost-effective and should be part of a comprehensive evaluation program supporting continuous improvement in Army DL.**

Since 1998, the Army's Training and Doctrine Command (TRADOC) has been engaged in establishing and fielding The Army Distributed Learning Program (TADLP) to enhance and extend traditional methods of learning. The Army intends to achieve a number of important goals through distributed learning (DL), including increased access to standardized training, improved unit operational readiness, and reduced costs. The Army envisages a greatly increased role for DL over time, and the development of interactive multimedia instruction (IMI) courseware is an important element of the training strategy.

Development and evaluation of Army DL is decentralized in individual proponent schools and centers, and there have been limited efforts to assess the effectiveness of DL training at the program level. TRADOC asked Arroyo to assess how efficiently and effectively TADLP has accomplished its objectives overall. For one component of this evaluation, the research team developed and tested a method of evaluating the instructional design and technical features of asynchronous IMI courses. Using standards from the training and development community, the team developed criteria to evaluate IMI courseware. The researchers then applied the criteria to a sample of 79 lessons from 10 high-priority courses in order to assess the feasibility of this approach for evaluating courseware in a highly resource-constrained environment, illustrate the kinds of information produced by such an evaluation, and demonstrate how that information can be used to identify areas for improvement in courseware and to monitor quality at the program level.

## Some Features of IMI Courseware Need Improvement

An example of the study results can be found in Table 3.1. Analysis revealed that *technical characteristics* were the strongest features of the courseware. All courses were easy to navigate, and cues to the learner's position in the course were readily accessible. The key areas for improvement in technical features are (1) ensuring that students can launch the courseware without professional assistance and (2) linking course content with supplementary instructional resources. Providing direct access to reference materials such as glossaries and field manuals could give students powerful tools for rapidly deepening their knowledge in specific task areas.

*Production quality* was generally strong (see Table 3.1). Narration was easy to understand, courses had minimal irrelevant content, and graphics and text were legible. Improvement is needed, however, in eliminating sensory

The research summarized here is published in Susan G. Straus, Michael G. Shanley, Rachel M. Burns, Anisah Waite, and James C. Crowley, *Improving the Army's Assessment of Interactive Multimedia Instruction Courseware*, Santa Monica, CA: RAND Corporation, MG-865-A, 2009. http://www.rand.org/pubs/monographs/MG865/

**Table 3.1**
**Production-Quality Criteria for Courseware**

| Criterion | Rating |
|---|---|
| Legibility of text and graphics | 0.80 |
| Audiovisuals | |
| Narration easy to understand | 1.00 |
| Minimal irrelevant content | 0.85 |
| Use of animation/video to demonstrate process | 0.75 |
| Techniques to maintain learner interest | 0.50 |
| Few sensory conflicts | 0.40 |
| 85–100% rated positive. 70–84% rated positive. < 70% rated positive. | |

The Army also can improve the quality of instruction and increase user engagement by designing IMI with higher levels of interactivity between the student and the courseware. For example, IMI that requires students to move objects on the screen can be used to train procedures such as using a compass. For more complex tasks, such as how to enter and clear a building, videogame-like simulations could be used in which learners must make decisions about appropriate methods of entry in a dynamic environment.

conflicts, such as simultaneous presentation of text and spoken narration, and in the enhanced use of multimedia.

Ratings of *pedagogical characteristics* revealed a number of strengths, including clear lesson objectives, appropriate sequencing of lessons, clear and comprehensive instruction of concepts, and opportunities for learners to correct their strategies in checks on learning. However, pedagogy was the area most in need of improvement. A pervasive problem was a lack of context or examples from job or mission environments. Courses also need to do a better job on instruction of procedures by providing clearer demonstrations, offering higher-fidelity opportunities for practice, and including explanations of why procedures work the way they do.

## Best Practices for DL Training

The results suggest that IMI is best suited for training concepts and processes, but can be used to train procedures in some situations:

- When procedures can be practiced realistically within the context of IMI, such as completing forms, or with the addition of simple job aids.
- When learning is not subject to rapid decay or is easily refreshed.
- When IMI supplements resident training.
- When training is supported by a high level of instructor-student interaction.

## The Method Can Contribute to Program-Level Assessments of Training Effectiveness

The method employed by the Arroyo research team provides a systematic method of evaluation using a comprehensive set of criteria based on standards proposed by training experts. It yields quantifiable data, enabling integration of results across courses, schools, and other units. It requires relatively modest resources. By applying the method to a larger and more diverse set of courses on an ongoing basis, the Army could gain valuable information about courseware quality, identify needs for improvement, and monitor the effects of changes to training policy, development processes, or doctrine.

In addition to evaluating courseware, a comprehensive evaluation of training quality requires several other types of measures and methods, including (1) measures of outcomes (student reactions, learning, job performance, and organizational outcomes); (2) test evaluation to assess the quality of course tests; and (3) administrative data, such as completion rates, cost data, and cycle time of courseware production, which can point to potential negative or positive aspects of course quality. Taken together, these measures would provide a basis for achieving continuous improvement in the development and use of IMI and help the Army reach its strategic goals for DL. ■

# The Advantages and Disadvantages of Seeking Commonality in Military Equipment

**Key Points**

- **Operational needs and the effects of commonality on them should drive the type of commonality pursued.**
- **RAND Arroyo Center identified four categories of components for which it is often advantageous to pursue commonality.**
- **Commonality can either decrease or increase costs, depending upon the net effect of multiple factors.**
- **Arroyo developed a decisionmaking aid to improve acquisition decisions regarding commonality.**

Increasingly, the Army and the Department of Defense (DoD) are developing families of systems built around common, base platforms so that variants share many key components. For instance, the Army has procured Stryker armored combat vehicles, which is a family of vehicles sharing a common base platform and thus most key components. Commonality can increase operational flexibility and reduce procurement, logistical, and training costs and burdens. However, commonality can also decrease design freedom and occasionally negatively affect operational capability by forcing design compromises to accomplish multiple missions, none ideally. And commonality can actually increase costs if it overly increases design complexity or if some variants end up with excessive functionality. These factors suggest that the pursuit of commonality should be informed by careful analyses.

To help the Army determine how to more effectively incorporate the full range of commonality considerations in weapon system development and acquisition, RAND Arroyo Center assessed the advantages and disadvantages of commonality and developed a decision aid to help Army policymakers manage these tradeoffs. The study drew upon historical and literature analyses as well as case studies of commercial and military efforts to exploit commonality.

## Types of Commonality

Operational needs and tradeoffs should drive the type of commonality pursued. There is no single "best" option that will apply to all types of common systems:

- A *hybrid* approach combines multiple capabilities that are normally separated into a single system.
- A *modular* system allows functions to be exchanged within one system.
- A *family* refers to a group of systems that share a platform.
- A *differentiated* system is distinguished by its unique platform, components, and capabilities in pursuit of specialization.

Hybrids offer operational flexibility but often at the cost of greater weight and some compromised capabilities. Modular systems offer the option of leaving behind modules that are not needed for the current mission, reducing the "mobility burden." This might make sense for capabilities that are expected to be used in environments with predictable lead times for changing components. A family approach eases the logistics burden, but it could leave some models with design sacrifices (e.g., if the platform weight class produces sacrifices for some missions).

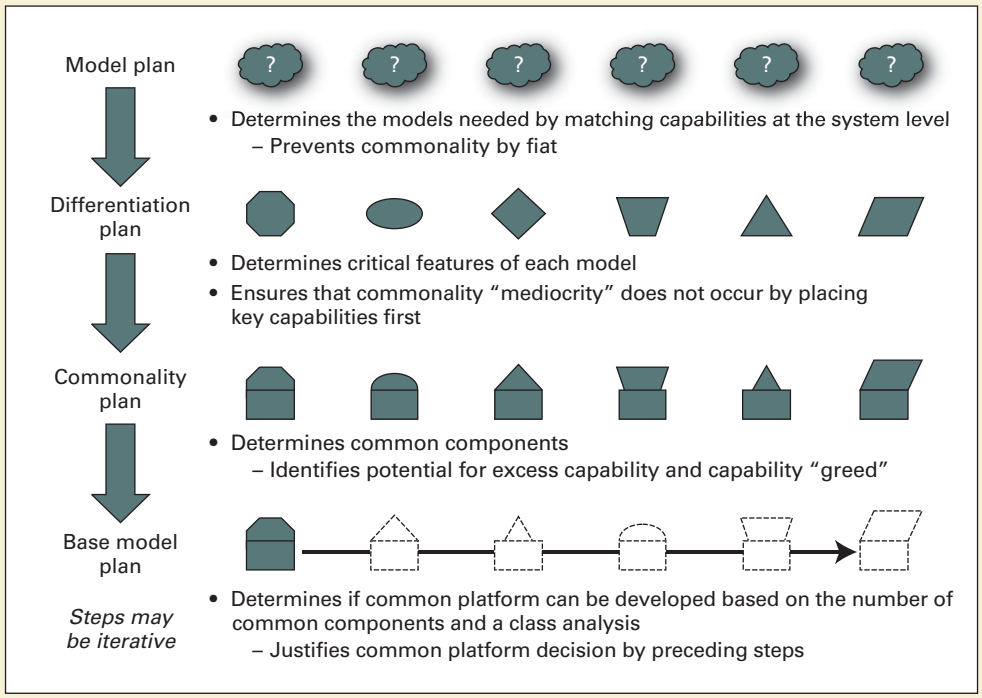
## Commonality Can Decrease or Increase Total Costs

Although greater commonality is often associated with lower costs, Arroyo's research shows a subtler picture.

---

The research summarized here is published in Thomas Held, Bruce Newsome, and Matthew W. Lewis, *Commonality in Military Equipment: A Framework to Improve Acquisition Decisions*, Santa Monica, CA: RAND Corporation, MG-719-A, 2008. http://www.rand.org/pubs/monographs/MG719/

**Figure 3.4**
**Capability-Based Commonality Decisionmaking Aid**




NOTE: The shapes in the figure represent the transition through the application of the decision aid from requirements with unknown physical attributes (the cloud question marks), to known features (the varying geometric shapes), to common components potentially based on a common platform (the common rectangle with varying shapes on top of it).

Depending upon how it is implemented and the specific applications, commonality can also increase costs. To assess the systemic value of commonality, the Army also needs to understand how the use of common items affects several different costs categories, including development, acquisition, sustainment, training, and personnel.

Arroyo identified four general categories of components for which it could be financially advantageous to pursue commonality:

- *Complex, expensive items* present opportunities for reducing costs by spreading the R&D cost over multiple systems (e.g., a new family of weapon platforms like the Future Combat System).
- High-demand items that have similar specifications can lead to reduced costs through economies of scale, lower inventory levels, increased purchasing power, and lower order costs, (e.g., certain vehicle engines, tires).
- *Items that are burdensome for operations or maintenance training* should be made common to save on the training burden and personnel needs.
- *Logistically burdensome items*, such as tires, tracks, engines, and transmissions, tend to dominate bulk storage, which can be problematic given the Army's storage constraints for mobile field warehouses.

However, the advantages of commonality must be traded off against the Army's desire for specialized or maximum operational capabilities.

## Analytic Method to Guide Commonality Decisionmaking

Arroyo developed an aid, based on commercial manufacturing models, to guide decisionmaking concerning commonality during the equipment design process. Figure 3.4 shows the four parts of the aid.

The materiel developer can use the aid to inform the requirements development process and whether to pursue differentiated systems. The designer can use this aid to choose among design strategies and balance the inevitable tradeoffs during the design process. The procurer can use the aid to audit the progress of development. And the logistician, trainer, and operator can use the aid to stay informed of relevant tradeoffs and to determine whether designers and procurers remain cognizant of their primary concerns.

History has shown that commonality can lead to outcomes that are both negative and positive. Informed decisions about commonality require nuanced analyses throughout the design, development, and deployment of a system or a group of systems, as well as formal tracking of outcomes. Using objective, informed analyses, the Army can determine which specific components should be made common, as well as when families of systems and hybrid approaches should be pursued. A decisionmaking aid like the one referenced here can assist in making better decisions by ensuring that all tradeoffs are carefully considered. ■

# What Should Be Stocked in War Reserve? A New Method for Allocating Resources

**Key Points**

- **Empirical demand data can be used to forecast contingency demands.**
- **Forward positioning should focus on fast-moving items with relatively low cost-to-weight ratios.**
- **The airlift avoidance and readiness benefits of stocking different items can be traded off to reflect different priorities.**

When Army units deploy rapidly for a contingency operation, it creates challenges for the initial sustainment of deployed units. While the units have some supplies with them, it is generally only enough for a short period. Beyond that, supplies need to come from theater-level inventory or have to be airlifted in. Theater-level inventory typically is established and replenished by sealift. However, it is likely to take 45-plus days for the first supply ships to arrive from the United States. While airlift could be used during this period, it is a scarce resource also heavily valued for early deployments. Additionally, when a contingency occurs, the global demand on the supply chain rapidly increases. Inventories maintained to support home station training become insufficient to fill all demands. The Army increases procurements to increase inventories and satisfy the higher demands. But since many items have lengthy procurement lead times, the "peacetime" level of inventory will sometimes run out in the face of the higher demand before increased deliveries begin.

The Army's war reserve secondary items (WRSI) within Army Prepositioned Stock (APS) address these risks. Stockpiles positioned overseas in strategic locations and aboard ships enable the rapid establishment of theater inventory. Additional inventory in the United States, not made available to support training, compensates until the industrial base can surge and provide a higher level of supplies. However, funding for WRSI stocks often falls short of the total requirement given the breadth of Army budget priorities, and the Army has lacked a formal method for prioritizing which WRSI items to buy for APS when funding is short.

The Army asked RAND Arroyo Center to develop techniques to prioritize the use of a $467 million FY 2007 budget for WRSI materiel for a Northeast Asia contingency scenario. Arroyo adapted actual demand data to derive forecasts of the potential contingency demands; determined which items should be forward positioned versus stored in the continental United States (CONUS) and delivered via airlift; and allocated the budgeted funding to maximize the WRSI inventory investment value with respect to readiness and minimizing the need for sustainment airlift early in a contingency.

## Empirical Demand Data Were Used to Forecast Contingency Demands

To determine what to stock in war reserve, the Army needs a way to know which items likely to be demanded in a contingency will have large demand increases. It is important for these items to be in APS to bridge the gap until production can surge. The Army also needs to know which items would demand substantial early airlift if not stocked forward.

The research summarized here is published in Kenneth Girardini, Carol E. Fan, and Candice Miller, *A Funding Allocation Methodology for War Reserve Secondary Items*, Santa Monica, CA: RAND Corporation, TR-793-A, 2010. http://www.rand.org/pubs/technical_reports/TR793/

**Table 3.2**
**Forward Positioned Items as a Percentage of All Items with Demands**

| Contingency Demand Data | % of Items | % of Demands | % of Total Value of Demands | % of Total Volume of Demands | % of Total Weight of Demands |
|---|---|---|---|---|---|
| OIF, March to September 2003 | 2 | 16 | 9 | 70 | 80 |
| OIF, January to June 2006 (time-phased) | 2 | 13 | 10 | 80 | 82 |

Arroyo analyzed pre-OIF and OIF demand data to identify items for which wartime demand increased substantially or stressed production capacity and were critical to operations. This analysis identified about 18,000 candidate items for possible war reserve funding.

Arroyo then used data from OIF in calendar years 2003 and 2006 to develop demand forecasts for a Northeast Asia scenario. The demand data were time-phased by deploying unit to account for the force buildup at the beginning of a contingency. Calendar year 2006 data were included to ensure that repair parts for newly fielded and upgraded systems would be considered and that phased items would not be stocked.

## Focus Forward Positioning on Fast-Moving Items with Low Cost-to-Weight Ratios

Even if the supply system has sufficient inventory to handle increases in demand, decisions about which items should be forward positioned in APS outside CONUS are key to ensuring that strategic airlift is not overtaxed. A forward positioned item should have high and regular demand. In addition, the item should have a relatively low cost per pound. For example, batteries are heavy compared to their unit price. If they are needed in large numbers, it is much more cost-effective to buy more for inventory and forward position them than to use valuable airlift capacity to transport them from CONUS.

Relatively few WRSI items need to be forward positioned to significantly reduce the airlift burden. The 1,800 items identified as good candidates for forward positioning accounted for about 80 percent of the volume (cubic feet) and weight of demands (see Table 3.2). These items represent less than 10 percent of the forecasted total demand value, showing that relatively small investments in inventory can produce substantial airlift avoidance. If forward positioned items are selected well, just one or two strategic lift aircraft per day will be required to meet contingency demands using stocks stored in the United States.

## Resource Allocation Method Trades off Time and Readiness Benefits

Arroyo also developed a method to determine the best set of items and inventory levels for a given funding level. This method takes into account how much each item, if included in war reserves, would contribute to warfighting capability (available or "ready" equipment) and would help avoid the use of strategic airlift. For this analysis, Arroyo also used the demand forecasts developed from the OIF demand data. However, the resource allocation method permits demand forecasts from any source to be used as an input. It also permits varying the weighting of the time periods and the weighting of airlift avoidance versus the readiness contribution. Arroyo varied the weighting factors to develop two potential allocation schemes for the Army. The Army used one of these, with updates for new items, as the basis for FY 2008 spending on WRSI materiel for a Northeast Asia scenario.[6]

Moving forward, the Army should ensure that the process for identifying items for war reserve is flexible and agile so that it can be updated quickly as equipment and operational forecasts change. ■

[6] Due to changing priorities, the FY 2007 budget for WRSI materiel was shifted to other needs.

SECTION 4

# Training and Education of Army Officers

Among the research products and services that RAND Arroyo Center provides to the Army is the training and education of Army officers as analysts. This educational function reflects RAND's goal, stated in its 1948 Articles of Incorporation, to "further and promote scientific, educational, and charitable purposes, all for the public welfare and security of the United States of America." RAND's institutional commitment to education and training gives Army officers the unique opportunity not only to work side by side with RAND analysts but also to engage with officers from other military services who are also at RAND participating in visiting analyst programs.

## Army Fellows Program

Each year the Army selects a number of majors and lieutenant colonels to work at Arroyo as visiting analysts in the Army Fellows Program.[7] This program affords officers the opportunity to increase their analytical capabilities through participation on Arroyo studies addressing critical policy issues facing the Army. In turn, their participation enhances Arroyo staff's understanding of current Army policies and practices. The one-year fellowship is followed by a three-year utilization assignment on a senior-level Army or Joint staff.

To date, 161 officers have participated in the program. Eight officers participated in the program in the 2009/10 cohort.


*The Army Fellows cohort of 2009/10, shown here at the Pentagon, included (left to right) Major Robert Jones, Lieutenant Colonel Kevin Kawasaki, Major Keith Palm, Major Mathew Guerrie, Major Noah Cloud, Major Albert Benson, Lieutenant Colonel Floreyce Palmer, and Lieutenant Colonel José Madera.*

[7] For more information, including eligibility requirements and application instructions, consult http://www.rand.org/ard/fellows

## 2009/10 Army Fellows

**LTC Kevin Kawasaki** is an operations research systems analyst (ORSA) who most recently served as the analysis branch chief for U.S. Central Command's Resources and Analysis Directorate, J8. Previous ORSA assignments include serving as an analyst in the HQDA G-3/5/7 Requirements, Analysis and Integration Division and HQ TRADOC Requirements Integration Division. Prior to becoming an ORSA, LTC Kawasaki served as a signal platoon leader, aviation battalion S4, and aviation company commander. LTC Kawasaki holds a Master of Engineering Management degree in operations research from Old Dominion University and a B.S. in mechanical engineering from the University of Southern California. As an Army fellow, LTC Kawasaki contributed to studies on Army global posture, analysis of jihadi strategies, assessment of Afghan national security forces, and accession flows in support of ARFORGEN.

**LTC José M. Madera** was most recently assigned as the knowledge manager for the Deputy Directorate for Antiterrorism and Homeland Security (J-34) at the Joint Staff. LTC Madera has served as an aviation platoon leader, civil affairs/special operations officer, detachment commander, and civil-military operations planner. He holds a Master of Military Art and Science degree from the Army Command and General Staff College, an M.S. from Carnegie Mellon University, and an M.A. and B.A. in philosophy from Purdue University. As an Army fellow, LTC Madera contributed to studies of Reserve Component full-time support, National Guard state partnership enhancement, and hybrid warfare. He also provided analytic support to the U.S. African Command (AFRICOM) and to U.S. Army Training and Doctrine Command's Unified Quest 2010.

**LTC Floreyce Palmer** was most recently assigned as the deputy commander for nursing and health services with the U.S. Army Medical Activity in Bavaria, Germany. Prior assignments include chief, quality management and chief nurse USA MEDDAC, Bavaria, Germany, and nursing supervisor and surgical head nurse at the Tripler Army Medical Center, Hawaii. She holds a B.S. and M.S. in nursing from Barry University, Miami, Florida, and is pursuing a doctorate in business administration from North Central University, Arizona. As an Army fellow, LTC Palmer contributed to studies of the ability of Army medical treatment facilities to meet beneficiary health care needs; the psychological, health, and behavioral effects of the ARFORGEN readiness cycle; and the Troops to Nurse Teachers program.

**MAJ Mathew Guerrie** was most recently the systems integration officer in the 407th Army Field Support Brigade. MAJ Guerrie served as an engineer officer through company command, taught courses in environmental engineering and geography at West Point, and served as a user representative for the intelligence community after joining the Acquisition Corps. MAJ Guerrie holds master's degrees in engineering management and environmental engineering and a bachelor's degree in environmental engineering from West Point. As an Army fellow, he contributed to studies of the effects and opportunities associated with theater provided equipment (TPE), small business sizing, data gaps in equipment lifecycle sustainment, and transformation of Army acquisition and procurement.

**MAJ Albert L. Benson, Jr.** was most recently assigned as a staff synchronization officer in the Force Modernization Branch of the Army Reserve Force Programs Directorate. He has served as a platoon leader, company commander during OIF 01-02, and a division chief of operations responsible for training and readiness oversight. He has also worked for over 10 years in various mid-level managerial/engineering positions within the manufacturing industry. MAJ Benson holds a bachelor's degree in industrial technology from Virginia Tech and a master's degree in military studies from the Marine Corps University. As an Army fellow, MAJ Benson contributed to studies of operational contracting support, Army equipping strategies, and the employer partnership initiative.

**MAJ Keith Palm** most recently served as the chief, public health nursing at Fort Drum, New York. During that assignment he deployed to Iraq and Afghanistan as a medical science and technology officer for Research, Development, and Engineering Command (RDECOM). Previous assignments include Fort Carson, Colorado; Joint Task Force Bravo, Honduras; Camp Casey, Korea; Fort Eustis, Virginia; and West Point, New York. He holds a B.S. in nursing from Penn State University and a Master of Health Promotion and Education from the University of Pittsburgh. As an Army fellow, MAJ Palm contributed to studies of the ability of Army medical treatment facilities to meet beneficiary health care needs and implications of the ARFORGEN process for Army installations.

**MAJ Noah Cloud** was most recently assigned as the 101st Sustainment Brigade's financial management support operations officer (plans) for Operation Enduring Freedom 2007–2009. MAJ Cloud served as an engineer platoon leader, battalion S4, company commander, and observer controller (Joint Multinational Training Command) prior to branch transferring to FA 36. He also served as a West Point admission officer. MAJ Cloud holds an M.B.A. from the University of Rochester (Simon School of Business) and a B.S. in civil engineering from West Point. As a RAND fellow, he contributed to studies of accession flows needed to support the ARFORGEN process, individual rotation tempo, and small business sizing.


*On February 12, 2009, Army fellow Eloy Cuevas (cohort of 2008/09) was promoted to the rank of lieutenant colonel. Colonel John E. Angevine, chief of the Office of Latin America, Europe/Eurasia, and Africa Analysis at the Defense Intelligence Agency, presided over the ceremony and conducted the reaffirmation of the oath of office. Army fellow Major Steve Cram (cohort of 2008/09) read the promotion orders. Pictured, left to right: Colonel Angevine, Lieutenant Colonel Cuevas, and Tim Bonds, then deputy director of RAND Arroyo Center.*

**MAJ Robert L. Jones III** was most recently a force management officer assigned to Headquarters, Department of the Army, G-3/5/7 in the Future Warfighting Capabilities Division. Prior assignments include Fort Bragg, North Carolina; Camp Page, Korea; and Fort Sill, Oklahoma. He holds an M.A. in management from Webster University and a B.A. in biology from the University of Mississippi. MAJ Jones is currently working on his doctorate in organization management from Capella University. As an Army fellow, he contributed to studies of the Army equipping strategy, deployment cycle support, and the future of the Army. ■

SECTION 5

# Selected 2009 Publications

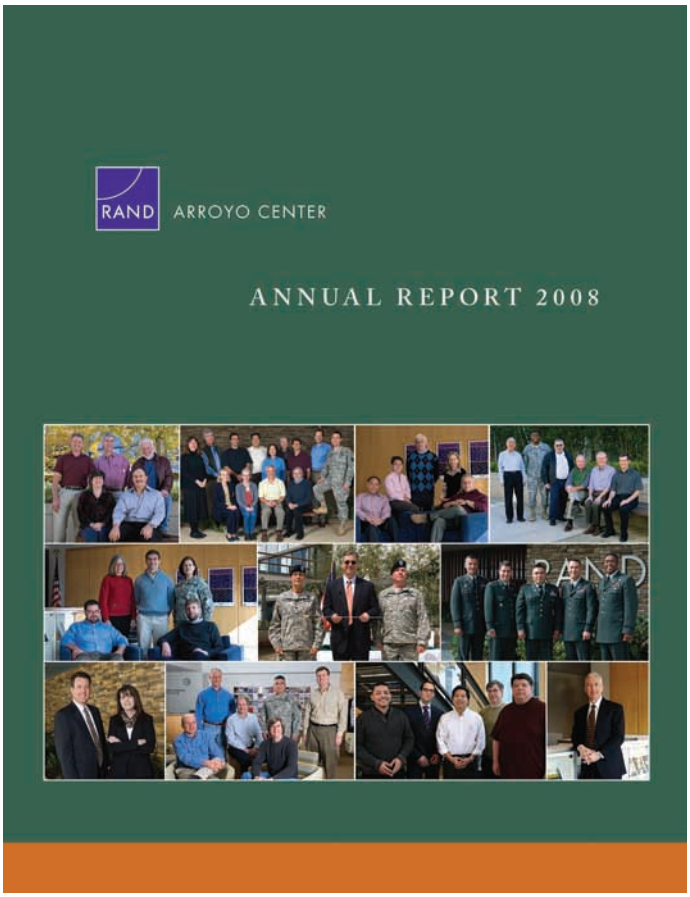
To fulfill its mission, RAND Arroyo Center places the results of its research in the public domain whenever such publication is consistent with classification and distribution restrictions. Army Regulation 5-21 enumerates three reasons for this open publication policy: "The Army encourages broad distribution of Arroyo Center results to achieve maximum benefit, to permit widespread peer review, and to increase awareness of issues identified by the Army leadership as important."

Arroyo publishes only research that has been peer reviewed to assure that it meets RAND's standards for high-quality, objective research (http://www.rand.org/standards/). Arroyo uses the same model of peer review that is standard for scientific journals, requiring each research document to be reviewed by at least two experts and revised in response to their recommendations before publication. Additionally, Arroyo research documents are approved for publication by the sponsoring Army office and cleared for public release by the Army Office of Public Affairs.

In addition to its annual report, RAND Arroyo Center produces research publications in five RAND series:

- **Monographs**: publications that include both research findings and policy recommendations for senior Army leadership.
- **Technical Reports**: publications targeted at analysts and other readers with strong technical expertise.
- **Documented Briefings**: publications that document briefings presented widely to the senior Army leadership.
- **Occasional Papers**: publications that present an informed perspective on policy issues important to the Army.
- **Conference Proceedings**: publications that document Arroyo-hosted conferences.

RAND Arroyo Center research publications that are unclassified and without distribution restrictions are available for free downloading at http://www.rand.org/ard/. A selection of Arroyo's publications in 2009 follows.



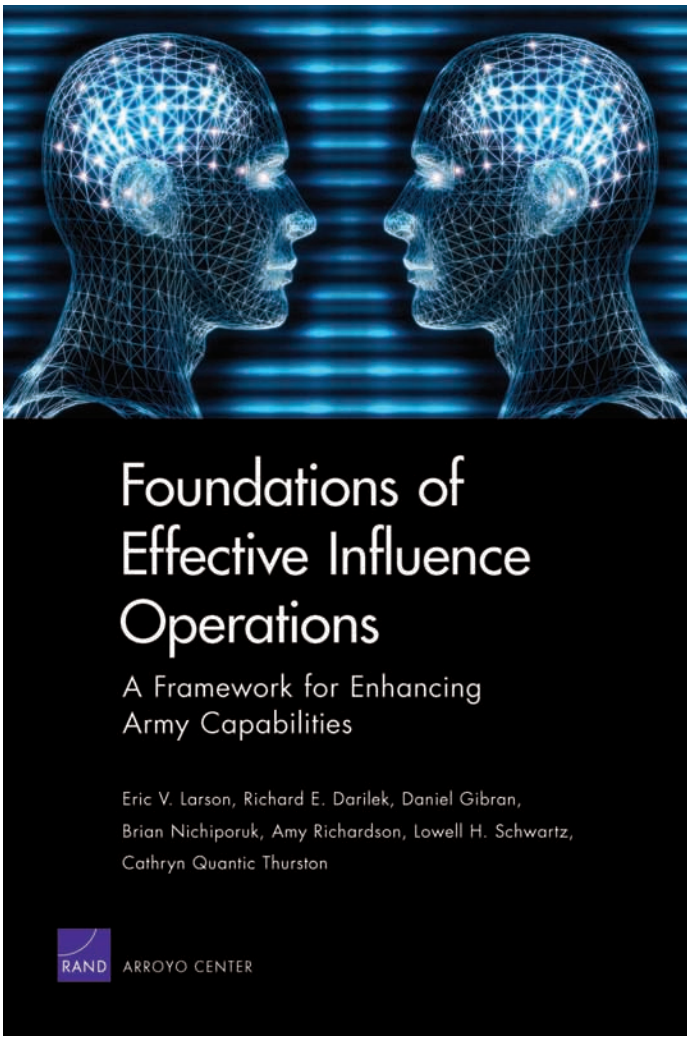

### RAND Arroyo Center Annual Report 2008

**AR-7134-A**

In a phrase, "helping the Army" is the mission of RAND Arroyo Center, through mid- to long-term research on the Army's enduring analytical challenges; in-depth analyses of major policy issues affecting the Army on the near-term horizon; and special, quick-response support on today's most urgent problems. Now in its 26th year of operation, Arroyo delivers products that reflect RAND's broader institutional principles—especially a dedication to high-quality, objective, and nonpartisan research and analysis. The work also reflects a close, collaborative engagement with the Army's senior leadership.

This annual report describes the breadth and depth of RAND Arroyo Center projects undertaken in fiscal year 2008. It also provides a comprehensive overview of the full range of Arroyo's research products and services, featuring short summaries of noteworthy studies and highlighting the contributions and achievements of selected researchers. As the Army strives to rebalance current wartime demands and long-term institutional requirements, RAND Arroyo Center stands ready to provide the objective insights necessary to make rational choices among imperfect, uncertain, and often competing options.

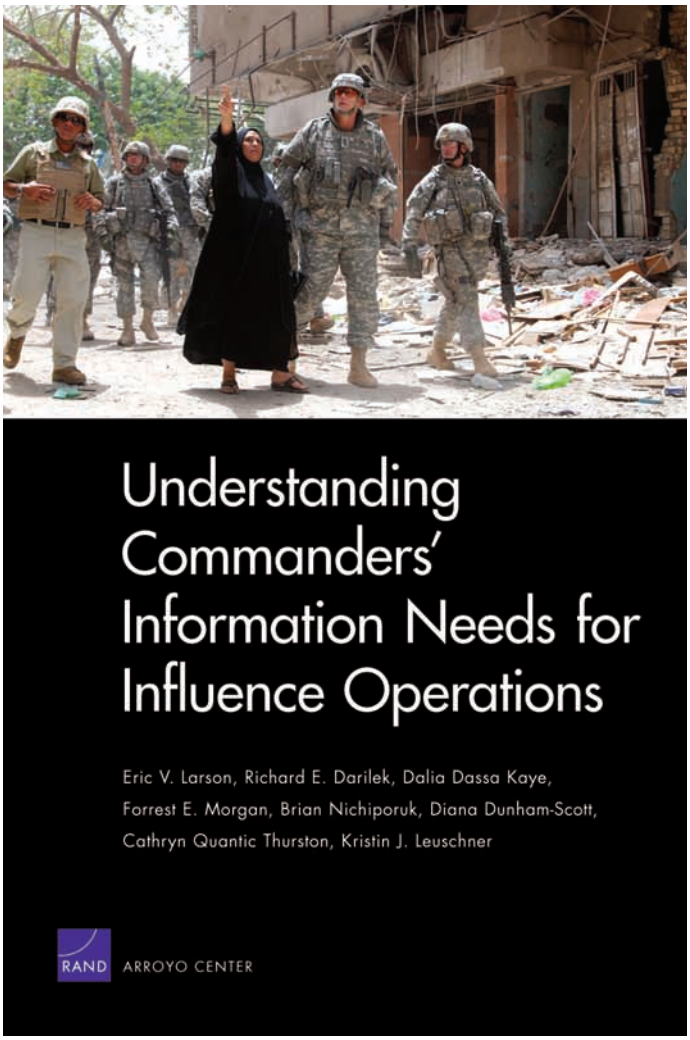
**http://www.rand.org/pubs/annual_reports/AR7134/**




**Foundations of Effective Influence Operations: A Framework for Enhancing Army Capabilities**
**Eric V. Larson, Richard E. Darilek, Daniel Gibran, Brian Nichiporuk, Amy Richardson, Lowell H. Schwartz, Cathryn Quantic Thurston**
MG-654-A

Interest has increased regarding capabilities that may allow the United States to effectively influence the attitudes and behavior of particular foreign audiences while minimizing or avoiding combat. This increase is largely the result of (1) the post-9/11 realization that the U.S. image in much of the Muslim world may be facilitating the mobilization and recruitment of global jihadists and (2) the difficulties that the United States has encountered in promoting stability and political reconciliation in postwar Iraq. Larson et al. aim to assist the U.S. Army in understanding "influence operations," whose purpose is to persuade foreign audiences. The authors identify approaches, methodologies, and tools that may be useful in planning, executing, and assessing influence operations.

**http://www.rand.org/pubs/monographs/MG654/**



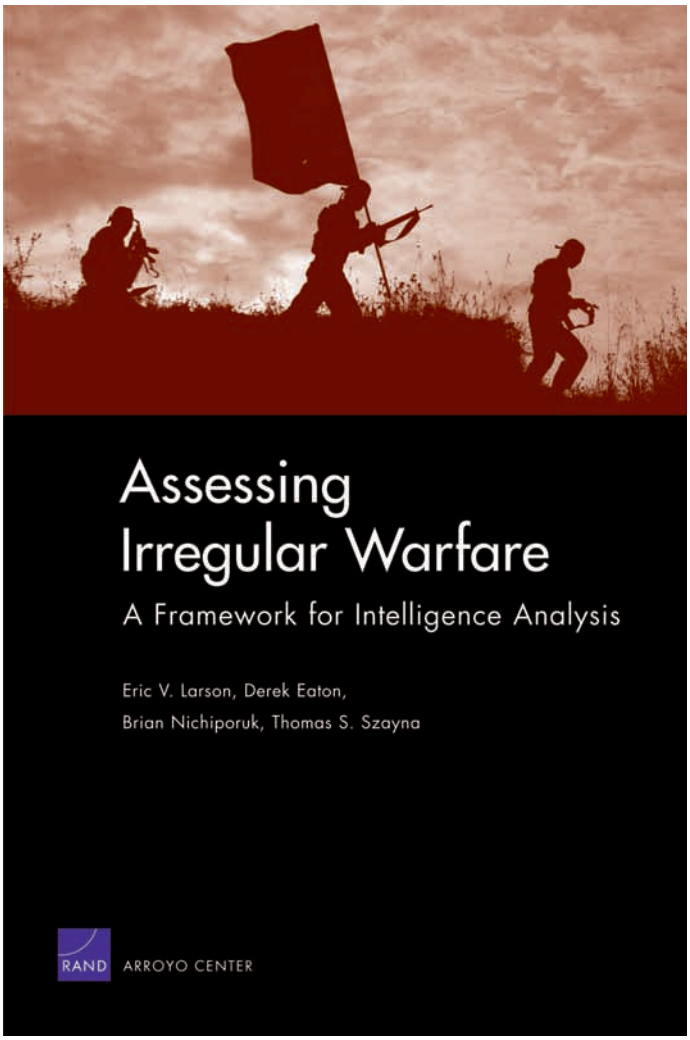

### Understanding Commanders' Information Needs for Influence Operations

**Eric V. Larson, Richard E. Darilek, Dalia Dassa Kaye, Forrest E. Morgan, Brian Nichiporuk, Diana Dunham-Scott, Cathryn Quantic Thurston, Kristin J. Leuschner**

**MG-656-A**

The objectives of this study were to develop a better understanding of commanders' information requirements pertaining to cultural and other "soft" factors (e.g., networks and hierarchies, cultural norms, attitudes) in order to improve the effectiveness of combined arms operations, and to develop practical ways for commanders to integrate information and influence operations activities into combined arms planning and assessment, increasing the usefulness to ground commanders of such operations. The monograph describes commanders' own views of their information needs for information and influence operations, identifies principal sources of commanders' information needs for these operations, and sets out important challenges associated with improving the ability of field commanders to plan, execute, and assess successful information and influence operations. Also included is a review of various indicators related to information and influence operations that have been used in the field; specific message themes that were used in Bosnia; a detailed analysis of tasks related to information and influence operations; an implementation plan for a metrics-based planning and assessment approach for information and influence operations that was developed in an earlier study; a taxonomy of information operations tasks and effects; and assessments of the suitability of two analytic techniques—expected utility modeling and social network analysis—for information and influence operations.

**http://www.rand.org/pubs/monographs/MG656/**



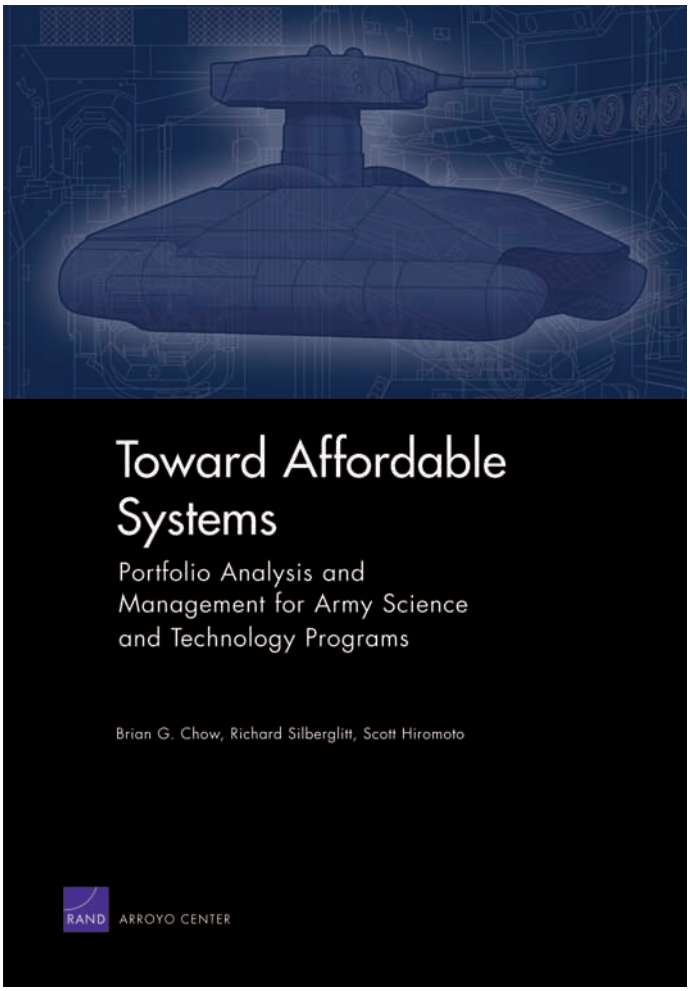

### Assessing Irregular Warfare: A Framework for Intelligence Analysis

**Eric V. Larson, Derek Eaton, Brian Nichiporuk, Thomas S. Szayna**

**MG-668-A**

The objective of this study was to provide an analytic framework for intelligence analysis of irregular warfare (IW) environments that could be used as the basis for a subsequent IW intelligence analysis curriculum development effort. The authors conducted a review of recent policy, strategy, doctrinal, and other materials pertaining to IW, concluding that although the term "irregular warfare" remains somewhat nebulous, situations considered within the realm of IW generally can be thought of in terms of two main stylized types: (1) population-centric IW situations, which include such missions as counterinsurgency, foreign internal defense, and support to insurgency, where the indigenous population is the center of gravity; and (2) counterterrorism operations, whether conducted as one element of a theater commander's campaign or as part of the U.S. Special Operations Command–led global war on terrorism, where a cellular network is being targeted. The authors identify the intelligence and analytic requirements associated with each of these two stylized forms of IW and describe a top-down framework, or analytic procedure, that can be used for assessing IW environments. Also included is a list of references to IW-relevant doctrinal publications.

**http://www.rand.org/pubs/monographs/MG668/**



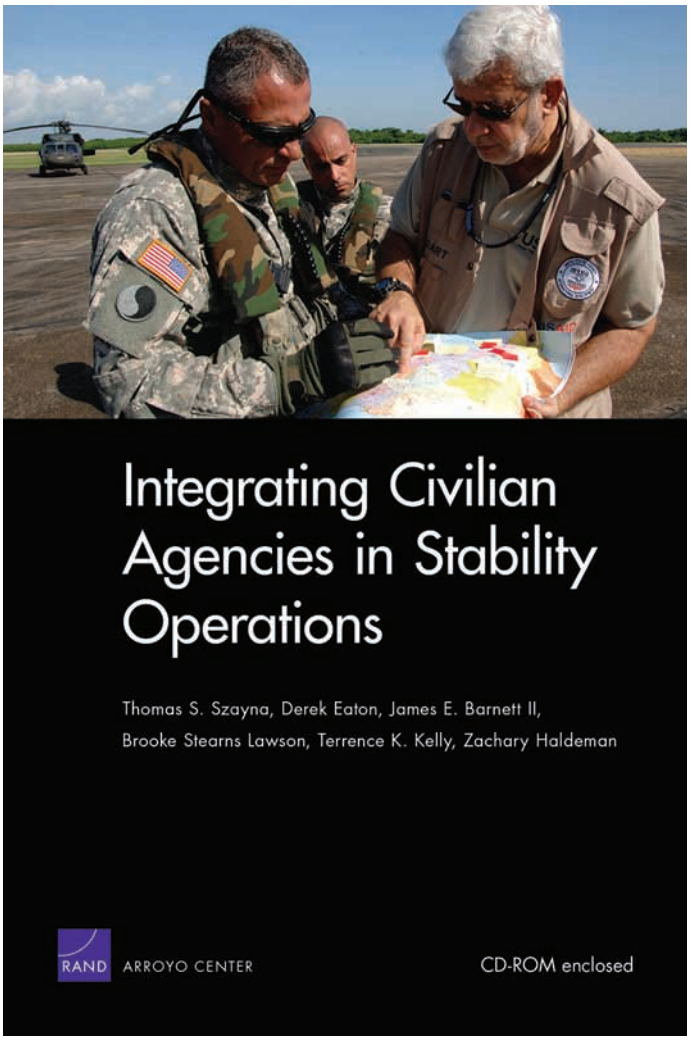

### Toward Affordable Systems: Portfolio Analysis and Management for Army Science and Technology Programs

**Brian G. Chow, Richard Silberglitt, Scott Hiromoto**

MG-761-A

Consistent with U.S. Department of Defense acquisition policy since 2003, U.S. Army leadership has called for consideration of lifecycle cost at system design and technology development stages so that adjustments can be made early enough to ensure affordability. This study developed and demonstrated a method and model to incorporate lifecycle cost into the portfolio analysis and management process for Army Science and Technology programs. The linear programming model developed here can select an optimized portfolio of Science and Technology projects to meet all individual capability requirements at the lowest total remaining lifecycle cost. The study results demonstrate several applications important to the management of Army Science and Technology programs, as well as estimation methods for the contribution of Science and Technology projects to capability requirements and for cost components.

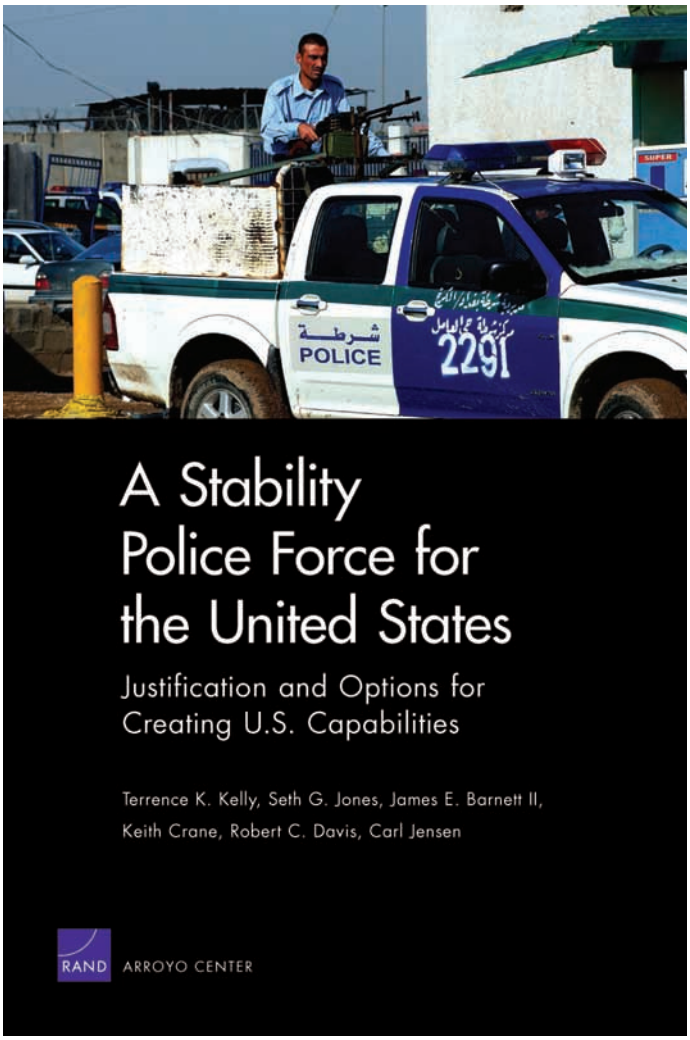
**http://www.rand.org/pubs/monographs/MG761/**




**Integrating Civilian Agencies in Stability Operations**
**Thomas S. Szayna, Derek Eaton, James E. Barnett II, Brooke Stearns Lawson, Terrence K. Kelly, Zachary Haldeman**
MG-801-A

In a project entitled "Integrating the Interagency in Planning for Army Stability Operations," RAND Arroyo Center examined the question of how the Army can help make key civilian agencies more capable partners in the planning and execution of stability, security, transition, and reconstruction (SSTR) operations. The authors identify the primary and secondary civilian agencies that should be involved in strategic-level planning and implementation of SSTR operations. Then, relying on available information on Provincial Reconstruction Teams and using a variety of federal databases, the authors identify the skill sets needed for the envisioned Field Advance Civilian Teams and where these skills reside in the federal government. The authors then assess the capacity of the main civilian agencies to participate in SSTR operations and analyze the recurring structural problems that have plagued their attempts to do so. The authors suggest a series of options that are worth considering in order to improve the current situation. Even without much action at the national level, the Army can still improve the situation by improving Army Civil Affairs and by executing a well-thought-out strategy of liaison officers assigned to the civilian agencies most important for SSTR operations.

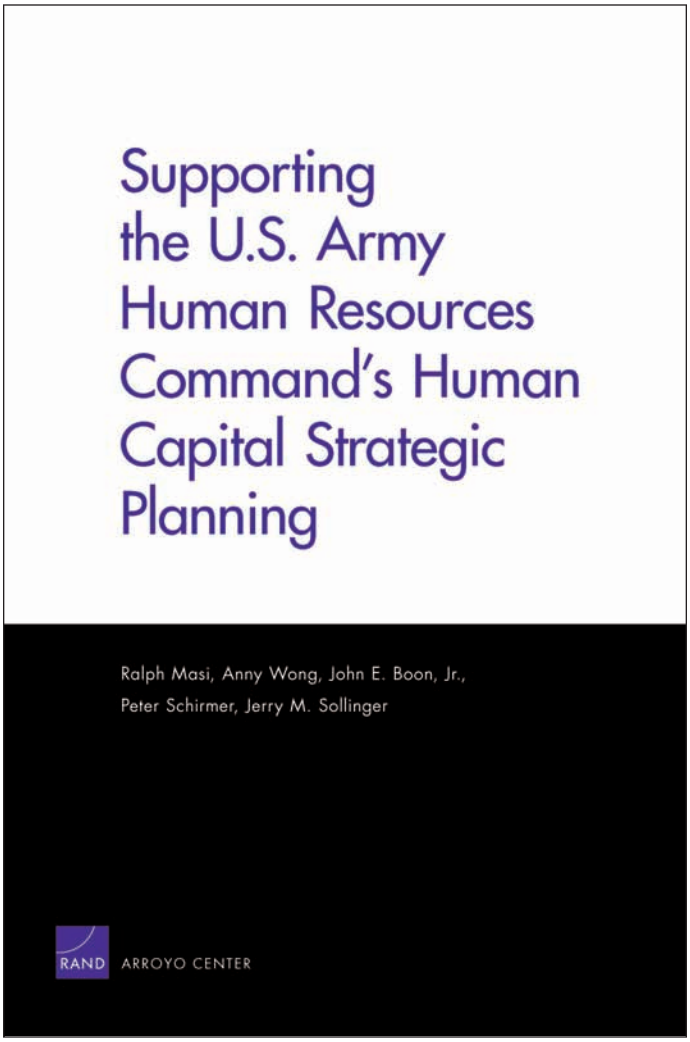
**http://www.rand.org/pubs/monographs/MG801/**




**A Stability Police Force for the United States: Justification and Options for Creating U.S. Capabilities**
**Terrence K. Kelly, Seth G. Jones, James E. Barnett II, Keith Crane, Robert C. Davis, Carl Jensen**
**MG-819-A**

Establishing security is the sine qua non of stability operations, since it is a prerequisite for reconstruction and development. Security requires a mix of military and police forces to deal with a range of threats, from insurgents to criminal organizations. This research examines the creation of a high-end police force, which the authors call a Stability Police Force (SPF). The study considers what size force is necessary, how responsive it needs to be, where in the government it might be located, what capabilities it should have, how it could be staffed, and what it would cost. This monograph also considers several options for locating this force within the U.S. government, including the U.S. Marshals Service, the U.S. Secret Service, the Bureau of International Narcotics and Law Enforcement Affairs (INL) in the Department of State, and the U.S. Army's Military Police. The authors conclude that an SPF containing 6,000 people—created in the U.S. Marshals Service and staffed by a "hybrid option," in which SPF members are federal police officers seconded to federal, state, and local police agencies when not deployed—would be the most effective of the options considered. The SPF would be able to deploy in 30 days. The cost for this option would be $637.3 million annually, in FY 2007 dollars.

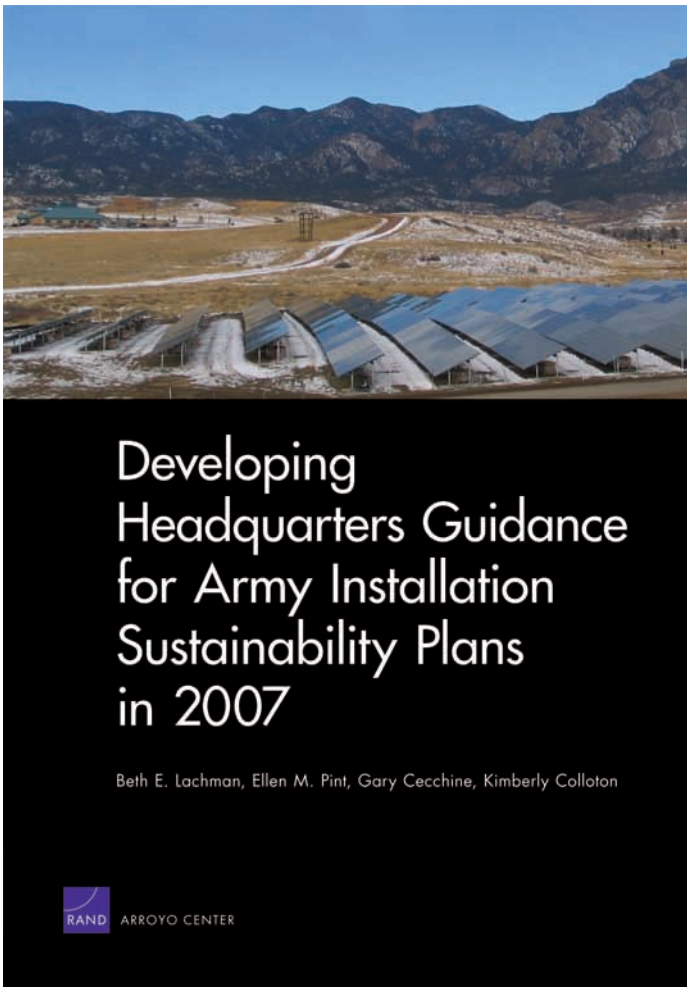
**http://www.rand.org/pubs/monographs/MG819/**




**Supporting the U.S. Army Human Resources Command's Human Capital Strategic Planning**
**Ralph Masi, Anny Wong, John E. Boon, Jr., Peter Schirmer, Jerry M. Sollinger**
MG-828-A

The 2005 BRAC legislation directed the Army to move its Human Resources Command (HRC) to Fort Knox, Kentucky, by 2011. The Army, in turn, directed that a staff reduction also take place at HRC, requiring reorganization. Ensuring that HRC actions stay consistent with new approaches to strategic human capital management throughout this transition is vital. HRC thus asked RAND Arroyo Center to produce personnel competency models and a framework for training to support its future delivery of personnel services in the context of its reorganization and relocation. The project focused on three tasks. One was to develop personnel competency models for jobs that would survive the reorganization. A second was to identify gaps between the competencies HRC would need and the ability to address them in the Fort Knox area. The final task was to develop training concepts to close gaps between current and future workforces. Interviews and analysis of survey responses enabled Arroyo researchers to identify 14 competencies organized into four major categories: enterprise perspective, management skills, domain knowledge, and leadership skills. Analysis also showed that it will be difficult for HRC to meet near-term workforce demand in the Fort Knox area, in part because demand will be so high. Research results indicate that ensuring a fully staffed and competent HRC workforce beyond 2010 will require intensive long-term recruiting, development, and management strategies, including prioritized retention strategies, national searches, and targeted recruiting. HRC should also begin partnering with Kentucky's educational institutions now, to produce workers with the necessary competencies over the long term.

**http://www.rand.org/pubs/monographs/MG828/**



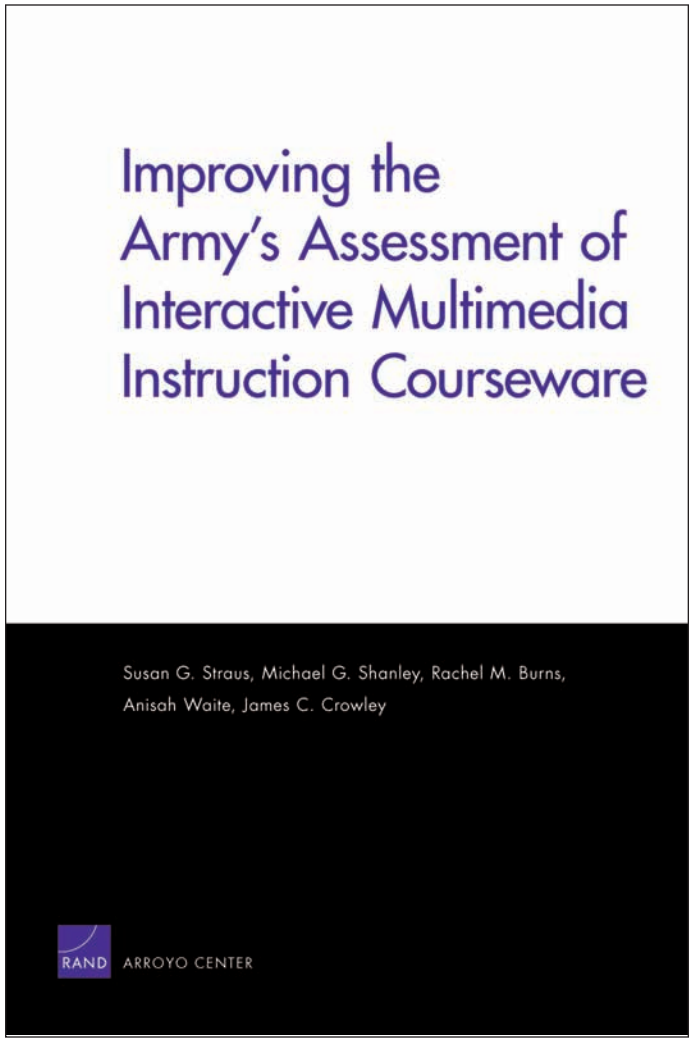

### Developing Headquarters Guidance for Army Installation Sustainability Plans in 2007

**Beth E. Lachman, Ellen M. Pint, Gary Cecchine, Kimberly Colloton**

MG-837-A

Given the experiences of industry and communities, many Army installations have started to develop and implement installation sustainability plans (ISPs). An ISP documents long-range plans addressing mission, community, and environmental issues developed through a strategic planning process. RAND Arroyo Center examined the experiences of Army installations with sustainability planning in 2007, and made recommendations to Headquarters, Department of the Army to help foster the effective development and implementation of installation sustainability plans throughout the Army. The authors provide background information on sustainability, describe the installation sustainability planning process at the time and progress in ISP implementation, and recommend approaches to improve the ISP process throughout the Army.

**http://www.rand.org/pubs/monographs/MG837/**



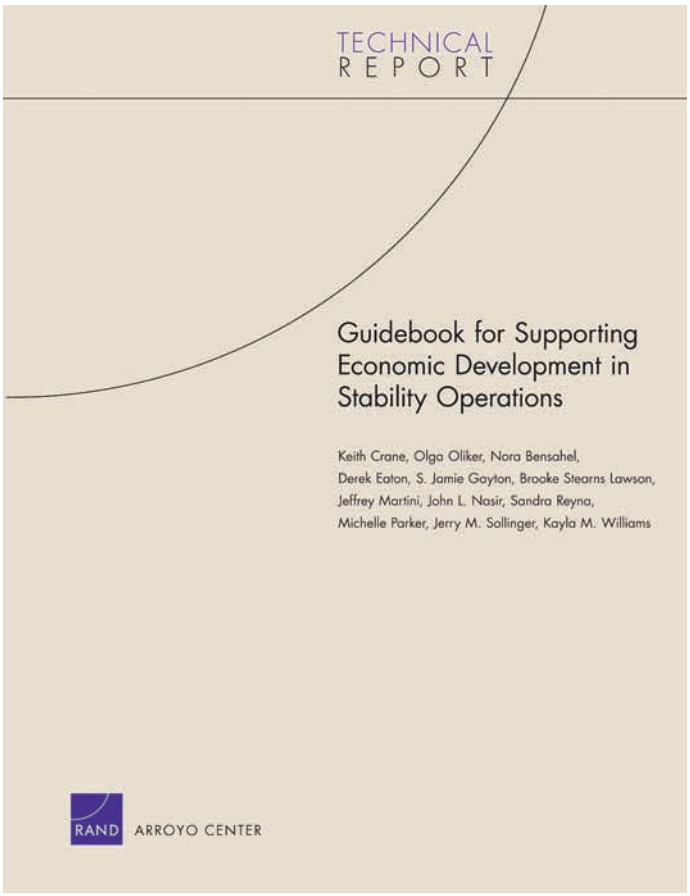

**Improving the Army's Assessment of Interactive Multimedia Instruction Courseware**

**Susan G. Straus, Michael G. Shanley, Rachel M. Burns, Anisah Waite, James C. Crowley**

**MG-865-A**

An important component of the performance of The Army Distributed Learning Program (TADLP) is the quality of its courses, which consist primarily of asynchronous interactive multimedia instruction (IMI). However, there are no current efforts to assess course quality at the program level. This monograph outlines a comprehensive approach to evaluating the quality of IMI within TADLP. In addition, it describes how a program-level evaluation program developed at RAND might be implemented within the U.S. Army Training and Doctrine Command (TRADOC). RAND assessed the quality of the learning experience in a sample of recently fielded IMI courses, using criteria based on standards in the training development community. The analysis identifies strengths and deficiencies in technical, production quality, and pedagogical aspects of IMI courseware. This research demonstrates a feasible method for evaluation that can supply TRADOC with metrics concerning IMI quality, points to directions for needed improvements, and provides a basis for assessing improvement initiatives. The authors recommend adoption of this approach, as well as further development of other components of a comprehensive program of IMI training evaluation.

**http://www.rand.org/pubs/monographs/MG865/**



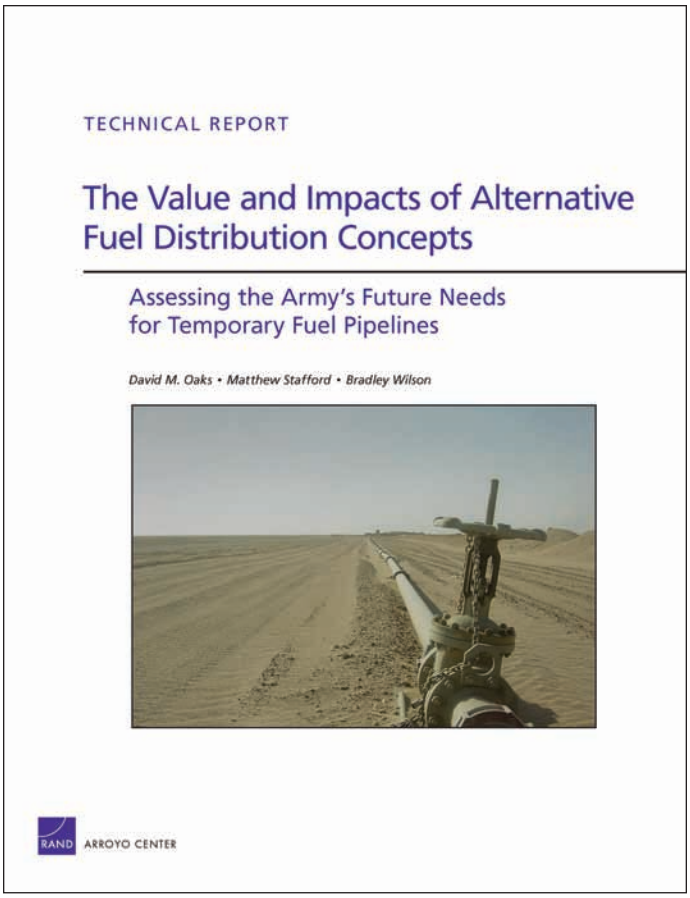

### Guidebook for Supporting Economic Development in Stability Operations

**Keith Crane, Olga Oliker, Nora Bensahel, Derek Eaton, S. Jamie Gayton, Brooke Stearns Lawson, Jeffrey Martini, John L. Nasir, Sandra Reyna, Michelle Parker, Jerry M. Sollinger, Kayla M. Williams**

**TR-633-A**

This guidebook is designed to help U.S. Army personnel more effectively use economic assistance to support economic and infrastructure development. The guidebook should help tactical commanders choose and implement more effective programs and projects in their areas of responsibility and better understand the economic context of their efforts. It describes key characteristics of the economic environment, the key players that soldiers are likely to encounter, and who may be involved in what sorts of assistance efforts. It also provides suggestions on what to do and what not to do, with examples from current and past operations. Suggestions for providing assistance are grouped into the following areas: humanitarian assistance; infrastructure and essential services; agriculture; currencies, budgets, finance, and foreign trade; private-sector development and employment generation; natural resource management; and the effects of the U.S. military on local economies. To write this guidebook, the authors visited commanders in Afghanistan, conducted interviews with returning U.S. military officers, drew on their own experiences in Iraq, Liberia, and the Balkans, and tapped the substantial literature about effective economic assistance.

**http://www.rand.org/pubs/technical_reports/TR633/**




## The Value and Impacts of Alternative Fuel Distribution Concepts: Assessing the Army's Future Needs for Temporary Fuel Pipelines

**David M. Oaks, Matthew Stafford, Bradley Wilson**

**TR-652-A**

This document describes a study done for the U.S. Army Combined Arms Support Command (CASCOM) to assess future needs for temporary petroleum pipeline structure. At the time this work was begun, the Army was weighing further development of a new pipeline capability, the Rapidly Installed Fuel Transfer System (RIFTS), and also conducting its normal cycle of future force structure planning. This project reviewed historical uses of temporary pipelines and surveyed future scenarios in order to develop a broad list of potential pipeline requirements. Next, against this list of likely requirements, the performance of several fuel distribution options—including existing and planned pipeline units and equipment, new pipeline options, and the use of trucks—was assessed across a variety of performance dimensions. The analytic results pointed to no clearly best choice. Instead, the preferred course of action is very sensitive to the decisionmaker's assessment of the environment and weighting among the importance of the different performance dimensions. A decision-support table to help the decisionmaker with this assessment is provided along with supplementary recommendations on near-term investment of reset funds and the reallocation of personnel within existing petroleum pipeline unit designs. The findings in this document should be of interest to those engaged with future Army logistics support force structure requirements.

**http://www.rand.org/pubs/technical_reports/TR652/**

For information on RAND Arroyo Center
or to request copies of this document, contact
**Marcy Agmon**
Director of Operations
RAND Arroyo Center
1776 Main Street
Santa Monica, CA 90407-2138
Telephone: 310-393-0411 ext. 6419
Fax: 310-451-6952
Email: Marcy_Agmon@rand.org

Visit Arroyo's web site at
http://www.rand.org/ard



---

**Photo credits**

Cover photos, clockwise from top left: Albert L. Kelley, Capt. James Reid, Staff Sgt. Curt Cashour, Staff Sgt. Brandon Aird, Pfc. Andrya Hill

Diane Baldwin: Pages 3, 8, 14, 21, 24, 25, 26, 29, and 48

Carol Earnest: Pages 13, 17, 22, and 30

Paula Dworek: Page 18

Arroyo Center Contracting Officer's Representative, MAJ(P) Steven Cram: Page 46

**www.rand.org**

**Headquarters Campus**
1776 Main Street
P.O. Box 2138
Santa Monica, CA 90407-2138
TEL 310.393.0411
FAX 310.393.4818

**Washington Office**
1200 South Hayes Street
Arlington, VA 22202-5050
TEL 703.413.1100
FAX 703.413.8111

**Pittsburgh Office**
4570 Fifth Avenue, Suite 600
Pittsburgh, PA 15213-2665
TEL 412.683.2300
FAX 412.683.2800

**New Orleans Office**
RAND Gulf States Policy Institute
650 Poydras Street, Suite 1400
New Orleans, LA 70130
TEL 504.558.1975
FAX 504.299.3471

**Jackson Office**
RAND Gulf States Policy Institute
P.O. Box 3788
Jackson, MS 39207-3788
TEL 601.979.2449
FAX 601.354.3444

**Boston Office**
20 Park Plaza, Suite 720
Boston, MA 02116
TEL 617.338.2059
FAX 617.357.7470

**Doha Office**
RAND-Qatar Policy Institute
P.O. Box 23644
Doha, Qatar
TEL +974.492.7400
FAX +974.492.7410

**RAND Europe**
Westbrook Centre
Milton Road
Cambridge CB4 1YG
United Kingdom
TEL +44.1223.353.329
FAX +44.1223.358.845

37, Square de Meeus
B-1000 Brussels
Belgium
TEL +32.2.791.7500
FAX +32.2.791.7900

As the Army's federally funded research and development center for studies and analyses, RAND Arroyo Center is charged with helping the leadership to identify the most critical challenges confronting the Army and with providing high-quality, objective research and analysis to support sound decisionmaking. This annual report describes Arroyo's research activities in FY 2009. It provides a detailed overview of the FY 2009 research agenda, features summaries of noteworthy projects selected to illustrate the agenda's breadth, and presents the results of quick-response studies conducted to help the Army leadership respond to pressing near-term problems. The full range of research products and services that Arroyo provided to the Army is covered, including peer-reviewed publications and the analytic training of officers in the Army Fellows Program.

RAND CORPORATION
OBJECTIVE ANALYSIS.
EFFECTIVE SOLUTIONS.

AR-7147-A